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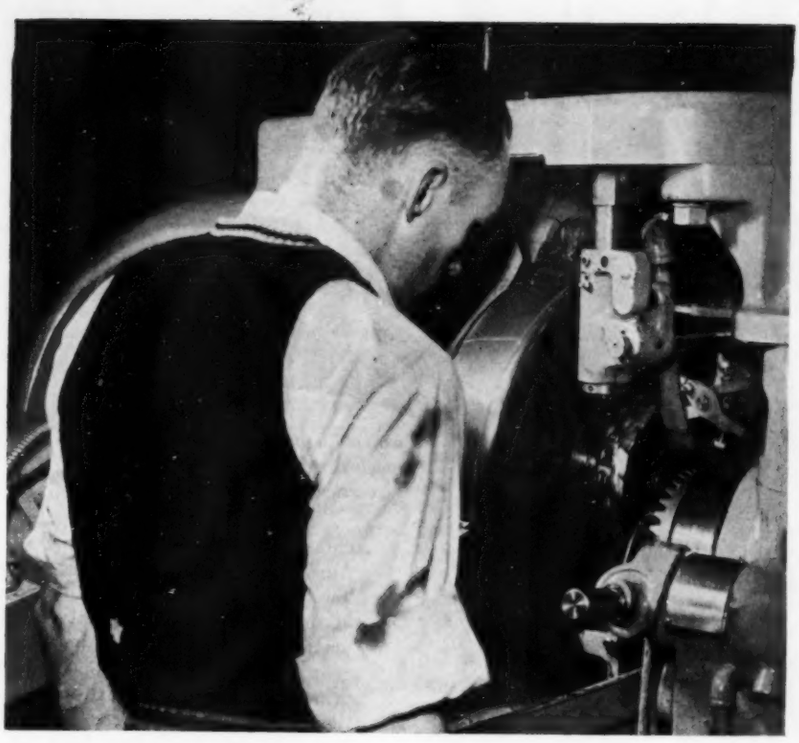


Only one revolution of the cutter is required for each gear tooth in the new type Gleason machine

PONTIAC'S NEW AXLE PLANT

A new battery of 103 gear cutters is just part of Pontiac's modern set-up for producing axles

BURNHAM FINNEY
Western Editor

DURING the 1936 season the Pontiac Motor Company built 176,222 cars. With its dealer organization greatly strengthened by a sound program designed to attract able merchandisers, the company is planning on an increase of 30 per cent or more the coming year. If the goal is reached, the volume of sales will soar well over the 200,000 mark for the best year in the company's history.

The notable strides made by Pontiac have necessitated expansion of the company's operations at its Pontiac, Mich., plant. Early this year it began making all the castings required in the manufacture of its cars in its revamped foundry, which was built in 1928 and had been idle since 1932. In tooling up for 1937 production, the Pontiac Motor Company carried out by far the largest annual development and expansion program in the three-year régime of President H. J. Klingler. This called for an expenditure of over $6,000,000, of which about $2,500,000 represents the cost of a new department for the production of axles. In this department are built all of the axles for Pontiac six- and eight-cylinder cars. About 50 per cent of the axle requirements of another General Motors division also will be fabricated by the department.

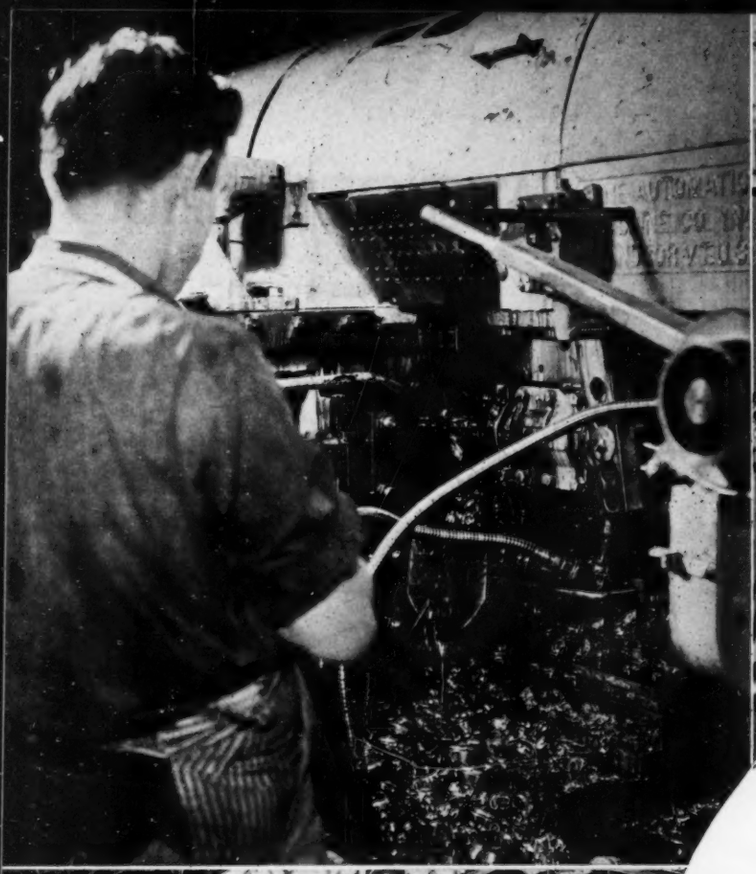
Occupying 66,000 sq.ft. of floor space, the new department is the last word in modernization. Its equipment of 315 machine tools is entirely new. Of these machines, 103 are Gleason gear cutters of the latest design.

Pontiac is reported to be the first company making axles to use non-generated ring gears. The new gear form calls for spiral-bevel, straight side gears; the pinion has generated teeth.

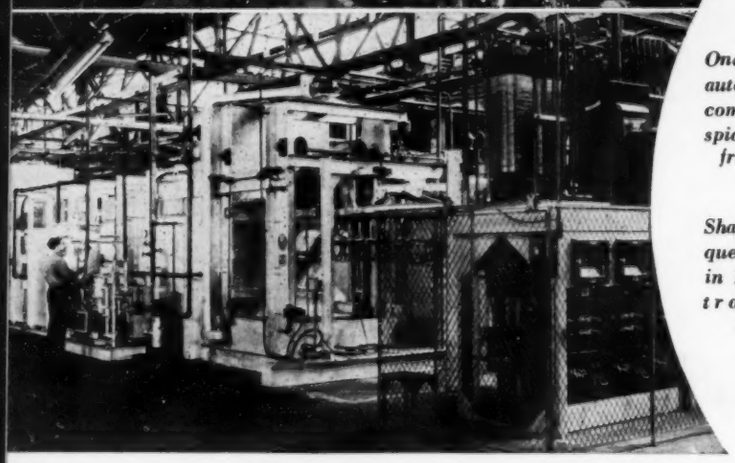
The new-type Gleason machines cut gears at a speed heretofore unknown. It is now possible to finish cut eleven gears per hour and to rough cut thirteen per hour, whereas formerly only a fraction of that number could be machined. Wherever possible, multiple operations are performed.

For the finish cutting of ring gears a battery of No. 11 single-cycle spiral bevel gear finishing machines is employed. The gears are rough out in standard Gleason roughers. Advantages of the new finishing method are that it takes only a single revolution of the cutter to cut one tooth; there is no lost time while indexing; omission of many working parts has been possible by simplicity of the machining operation; every unit is extremely rigid; the slow-turning cutter spindle is the only moving part in operation during cutting; when the cutter revolutions equal the number of teeth, the gear is finished.

Six No. 9 Gleason completing generators are used to rough and finish cut the teeth of the side gears. The machine has four rotary stations. At the



Two at a time axle shafts are broached for correct length in a vertical hydraulic machine



One of three Cone automatics almost completely machines spider gear blanks from 2⅞ in. stock

Shafts are heated, quenched and drawn in 100 min. in a controlled atmosphere electric furnace

uppermost station the work is loaded. At the next station the teeth are rough cut and the work is advanced to an intermediate station. A simple gaging device stops the machine at this station from further operation unless all teeth have been roughed to full depth. The work then moves to the finishing station. After finish cutting, the work progresses to the loading station where it is automatically released and removed by the operator. Five Gleason completing generators are employed in cutting the teeth in the small pinion gear.

A number of Gleason No. 16 generating machines perform the work of cutting the teeth of the pinion gears. These machines are of new design, free from noise and vibration, and have an improved type of cutter cradle mounted on roller bearings as well as new reversing and indexing mechanisms.

Ring gears are completely finish turned on three 8-in. eight-spindle Type D Bullard Mult-Au-Matics. The machines are of the double-index type, with both the first and second chuckings done on the same machine at the same time. This is possible with the first and second stations as loading stations and the balance of the stations alternately second and first chuckings. The time per piece is cut materially by using two heads through splitting the face cut of the gear.

After the facing operations, the gear passes through a small machine which stamps on the gear ratio and the date for later identification. The large hole in the gear then is broached to the size used on the Gleason gear cutting machines, this work being done on an American vertical hydraulic broach. Twelve screw holes are multiple tapped at one time on a Cincinnati Bickford vertical drill press. The back of the gear is ground on a rotary surface grinder to get a good finish for locating the gear on the Gleason gear generators. After the gear teeth have been cut, the gear goes to a Gleason gear testing machine, passes through a washing machine and is transported to the heat-treating department.

Ends of the pinion gear are first milled to length on a Davis and Thompson rotary miller. They go through a double-end centering machine which is semi-automatic. Both the head end and the stem of the gear are turned on two Lo-Swing lathes, one machine doing the roughing and the other the finishing. The spline is hobbed on a Barber-Colman horizontal hobbing machine and the bearing diameter is ground on a double-wheel Landis grinder. Inspection follows before the work moves to the Gleason cutters.

The outside diameter of the flange of the axle shaft is hollow milled on a Baker drill press. Shafts then are hardened and annealed in two electric furnaces of special design. The hardening furnace and the automatic quenching apparatus are in a straight line, with the draw furnace alongside, the work being carried through hardening and quenching and returning in a counterflow direction through the drawing operation. A gas generator suitable for butane or city gas produces a protective atmosphere in the furnace.

Together with the gas-seal hoods at either end, the hardening furnace is 40

ft. long, 7 ft. wide and 12 ft. high. Axles are loaded on heat-resisting alloy fixtures, each fixture accommodating four axles suspended vertically across the width of the furnace chamber. With exception of loading and unloading, operation is automatic. At the end of the hardening furnace is a large tank embedded in the floor and filled with quenching water circulated by a centrifugal pump. To the ends of the furnace framings are attached semi-circular tracks running to the ends of the draw furnace, which is similar to the hardening furnace but somewhat lighter in insulation.

The hardening furnace has three heating zones, and the draw furnace four; each is equipped with thermocouple, heat fuse and individual Leeds & Northrup Micromex control units. The furnaces were designed and built by the Electric Furnace Company.

The outside diameter of the flange of the shaft is used as a locating point for straightening after heat-treatment. All shafts are put through a Gogan Brinell hardness testing machine to test the spline end. This end then is broached to length on a vertical Hudson Lapointe hydraulic vertical broach. Two shafts are broached simultaneously. The spline, bearing and oil slinger diameters are turned and the inside of the flange rough faced on three 10-in. six-spindle No. 2 Bullard Contin-U-Matics, each equipped with self-energizing chucks. The long turning cut at the small end of the shaft is split, two cutters performing the operation and each cutting half the turned position.

The bearing diameter is rough ground and the spline diameter finish ground on an inclined type No. 5 Cincinnati centerless grinder with a multiple wheel set-up. Interesting features are a differential regulating wheel unit to obtain the correct peripheral speed on each regulating wheel; a hand infeed sizing mechanism; a set of cylindrical cams for the hydraulic truing devices; a hand-operated loading attachment to bring work to and from the work-rest blade; a lubricating system for pre-oiling and spindle bearings before the machine is set in motion; an hydraulically-operated infeed mechanism; a special infeed work rest including two angular top blades for the splined end of the work and with a roller for the bearing diameter; and a one-ton trolley hoist for lifting the wheel mount.

Shaft Surfaces Ground

The bearing diameter of the shaft is semi-finish ground on a No. 2 Cincinnati centerless grinder equipped with a special infeed workrest having an outboard adjustable U-rest at the rear. A similar machine finish grinds the bearing diameter.

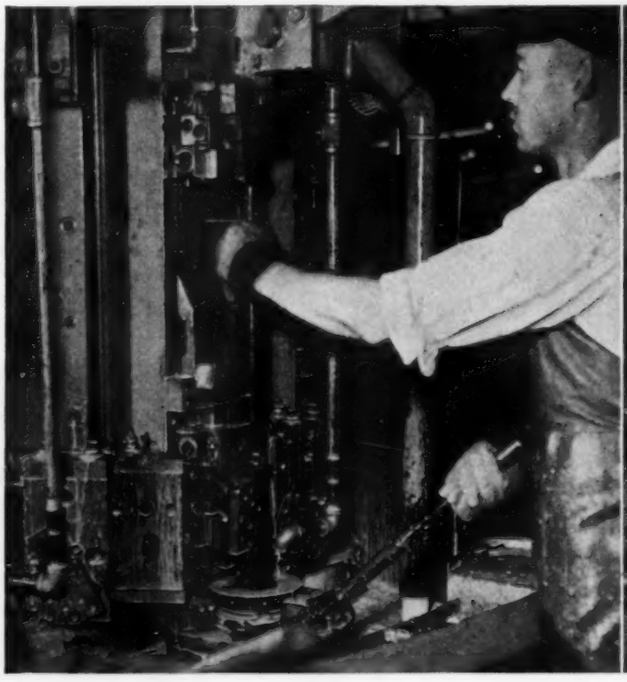
A chucking operation of special interest is done on a battery of five Bullard Multi-Au-Matics, each having six spindles. The shaft is dropped into the hollow spindle and held by a hand-operated fixture which centralizes as well as grips the work. The lower end of the shaft is supported by a bushing in the bottom of the spindle to prevent whipping. The top side of the flange is machined and a cut taken on the underneath side.

Two Operations in One

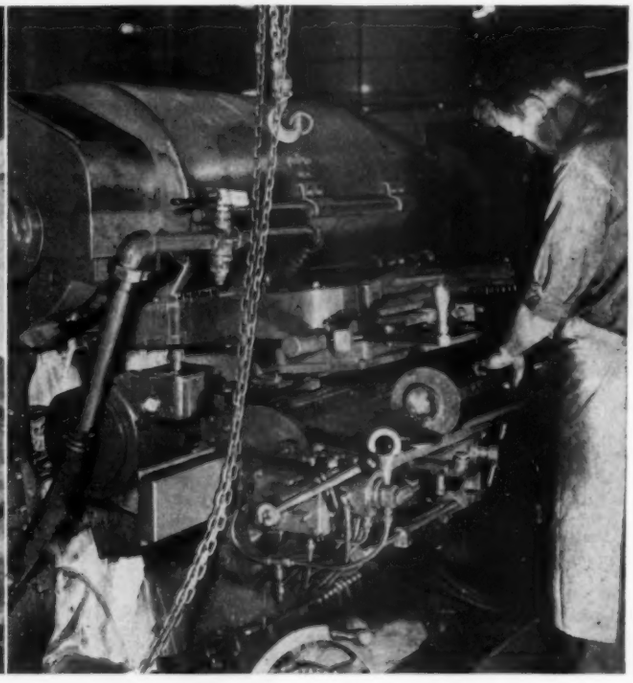
Departing from previous practice, Pontiac grinds the pilot diameter and the adjacent face of the shaft simultaneously on two No. 2 centerless grinders. Each machine has a chucking type head with a hollow spindle to hold the shaft. The spindle is mounted at 45 deg. to the grinding wheel spindle. The spindle nose is arranged to take a chuck. The rear end of the shaft is supported by an easy push fit bearing on the splined end. An air-operated rapid-advance-and-retraction unit moves the special head about 2½ in. A special grinding wheel truing fixture is provided for truing the double faces of the grinding wheel at 45 deg.

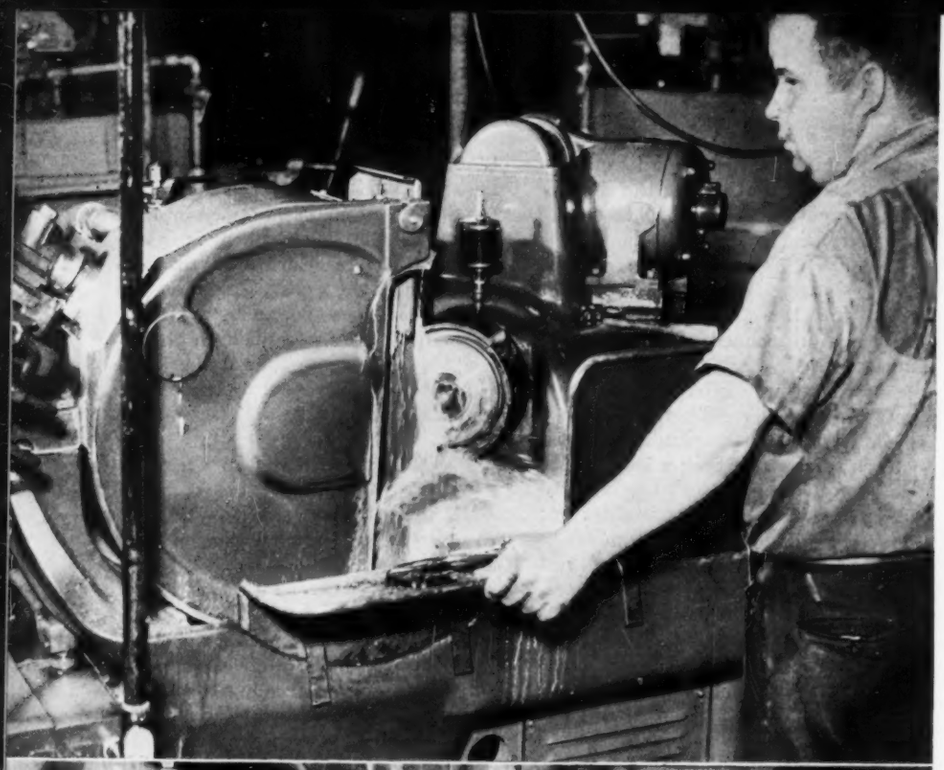
The oil slinger diameter is finish ground on a Landis grinder with a special chuck. Two eight-spindle Cleveland hobbing machines are employed to hob the splines of the shafts. A Toledo press is utilized to serrate the

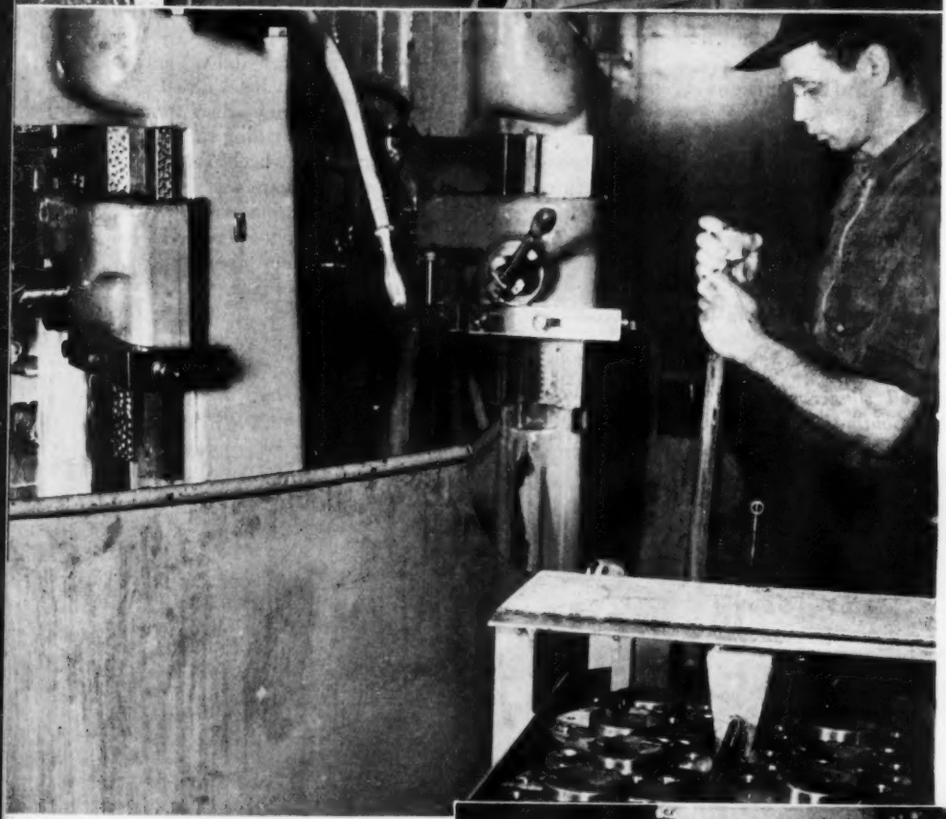
Spline diameter, bearing diameter and oil slinger are turned, and the flange is faced in a Bullard Contin-U-Matic



A big No. 5 Cincinnati centerless rough grinds the axle shaft center bearing and finish grinds the spline diameter







bolt holes in the flange. Shafts then move by conveyor through a washing machine prior to assembly.

Two Goss & De Leeuw automatic chucking machines of the rotary, four-station type perform the first operation on the differential carrier. Here the carrier and the lugs are rough and finish faces in the first two stations and the pilot diameter is turned in the third station. The tolerance allowed is 0.001 in. Tungsten carbide tools are used on the first two operations.

Three diameters on the carrier are bored simultaneously on three Fitchburg horizontal, three-spindle machines containing four stations, one of which is the loading station. Each machine rough bores all diameters in one position and semi-finishes in two positions. This leaves 0.012 to 0.014 in. to be diamond bored. The cross bore is rough drilled on two Baker horizontal double-end boring machines. Two similar machines ream and tap the cross holes.

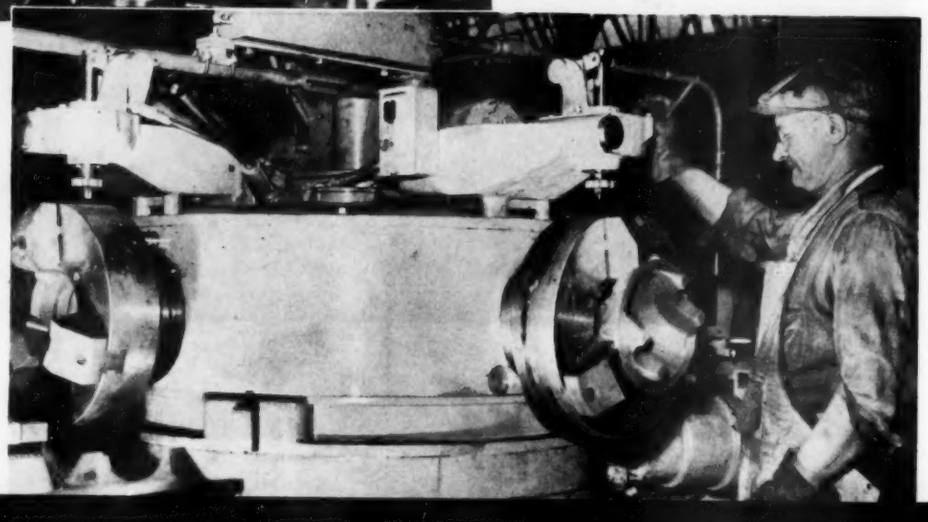
Cross bores of the carrier are precision bored and the pinion bore (at 90 deg. to the cross bores) is faced on an Ex-Cell-O three-way precision boring machine. The boring and power units at each end of the machine are for boring the cross hole at that end of the case, while the boring spindle and power unit at the back of the machine is used for step boring three different diameters and for facing the pinion bore to depth in the same cycle. Boring tools are Carboloy-tipped and are individually adjusted on each boring unit. The fixture is self-contained and of the angle plate type with the work located in a hardened locating ring registered from the pilot diameter on the flange of the work and radially by means of locating pins in previously reamed bolt holes in the work.

First machining work on the differential case is to hollow mill both ends of the hub and to drill, center and face them. The seat and pilot diameter are rough turned in one operation on a Fay automatic lathe. The gear seat, pilot diameter hubs and shoulders are semi

A single grinding wheel faces the outside axle shaft flange and finish grinds the pilot diameter in one operation

Axle shaft splines are hobbed in a large eight-spindle Cleveland machine

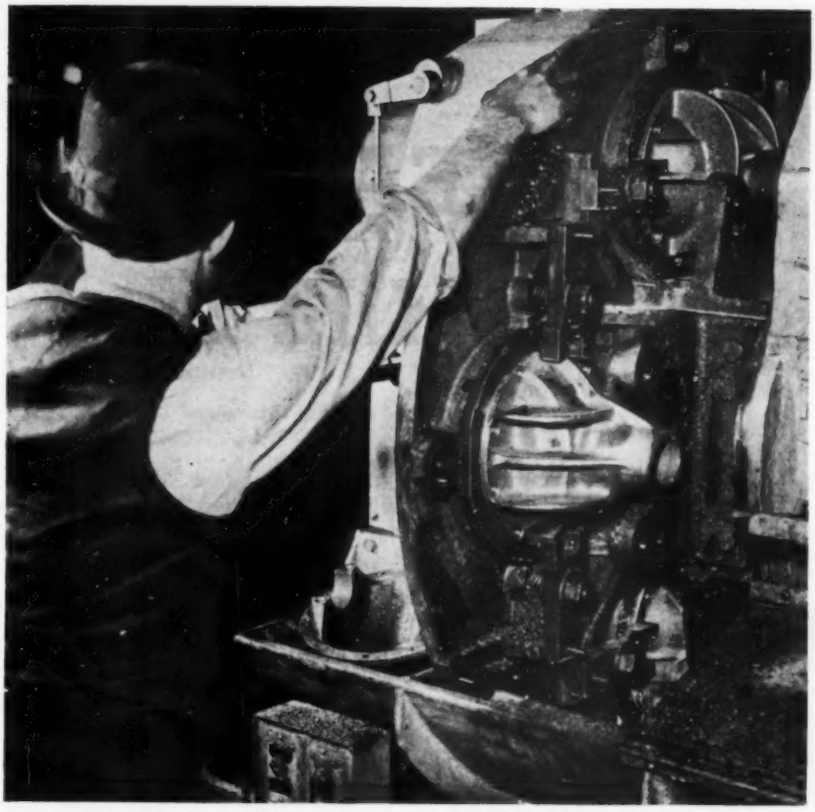
Two Goss and DeLeeuw four-station rotary chucking machines face the flange and ends of the carrier lugs to within 0.001 in.



finished on two Fay automatics and are finish turned on two similar machines. During finishing, the case is mounted on an arbor. The work remains on the arbor during the finish grinding of both ends of the hub on a Landis machine with an extra-heavy spindle carrying two grinding wheels.

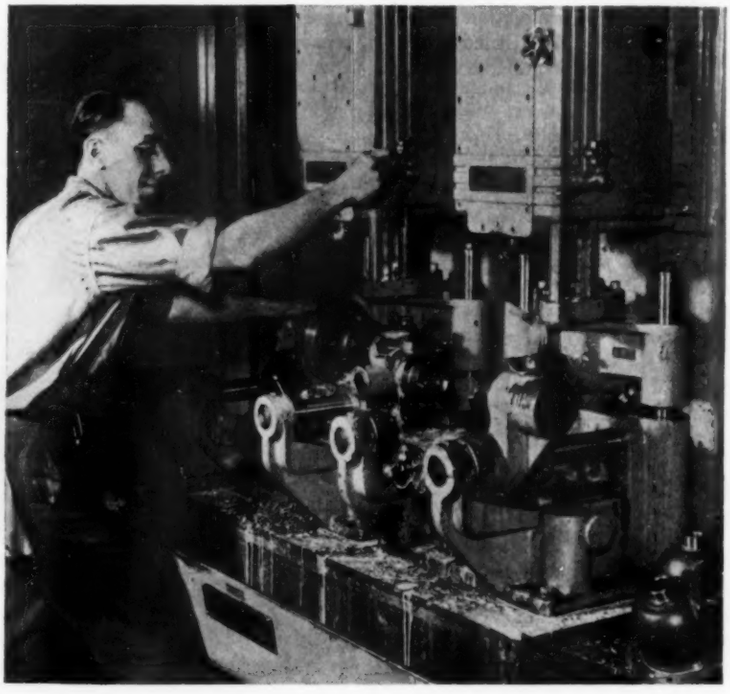
Side gear seats in the differential case are rough and finish faced on a two-spindle Ex-Cell-O horizontal indexing machine. Side gear hubs are rough and finish counterbored on a similar machine. Each unit has a rotary type fixture in which one case is located on the trunnion hubs in one direction and a pilot entering the spider bores located in the work in the other direction. The cutter is carried on a hinged overhead leaf and is operated by a driving bar from the hydraulic unit. The leaf supporting the cutter is raised manually to clear the fixture and the fixture then is manually indexed 180 deg. and locked in position while the operation is repeated on the opposite side of the work.

Differential side gears are bought as rough forgings with the hole rough drilled. Pontiac then redrills the hole and chamfers it. The small pinion gear is made from carbon steel bar stock 2⅞ in. in diameter in four operations in a Conomatic machine, emerging from this machine ready for finish machining. Large pinion gears are heat-treated, after being machined, and go by overhead conveyor to asembly. They are tested, and if the bearing diameters have become warped or distorted in heat-treating, they are straightened. Centers are cleaned out and bearing diameters are finish ground. After the ring gear and pinion gear are matched, the two are lapped on Gleason lapping machines.



Fitchburg horizontal four-station machines bore the differential carrier in three stages

An Ex-Cell-O vertical boring machine faces the spherical seat for the differential spider gears



The differential pinion gear seat of the differential case is spherically faced on an Ex-Cell-O two-station vertical machine. The part is located in the fixture on the work hubs radially by means of a hydraulic plunger at the bottom of the fixture which enters the spider hole. The fixture then is moved backward manually to the work position so that the cutter horn, which supports and operates the cutter, enters the opening in the work. A hydraulic plunger locates the work in this position and the hydraulic units are started on their operating cycle.

The spherical cutter has a pilot nose which enters the same hole from which the work is registered. After this operation is completed, the fixture is withdrawn from the cutter nose, the work unlocked and removed from the fixture, and reloaded to permit facing of the opposite spherical seat. This is necessary, as there is only one opening at the side of the work which will permit the cutter to be inserted.

SURFACE QUALITY

R. E. W. HARRISON
Vice-President, Chambersburg Engineering Company

IT IS a long way back to the years of the war but to mechanical engineers the extended cruising radius of the German submarine always seems capable of explanation by reason of mechanical efficiency which in turn made possible what was then a super performance between major overhauls. Careful examination of the wearing parts in the machinery of those submarines turned in after the war revealed that high compression between cylinder walls, valves and pistons was maintained because the parts had been ground. The initial wear had been low and controlled, and the final wearing surface highly finished and maintained at the correct tolerance. Here was a first class demonstration twenty years ago of the benefits of finish control and standardization.

The practice of grinding high compression submarine and other internal combustion engine parts grew rapidly, the higher finish and improved durability of accuracy being used to commercial advantage in offsetting the somewhat higher investment per horsepower as compared with the steam engine which was gradually being replaced as a prime mover.

The next development of note came as a direct result of the submarine engine manufacturing practice, and this time it was in the locomotive field. For years, locomotive manufacturers had scoffed at the awakening demands for real accuracy and finish control in locomotive valve gears. But a test carried out over a 16-month period on typical two-cylinder passenger locomotives, one engine having all its wearing surfaces ground, while the other had been finished by the then conventional method convinced the progressive chief engineer of a major railroad that he had the answer to one important phase of the problem of converting steam pressure into mechanical energy. To use his own words: "I can estimate and provide for the initial wear and when this has taken place my working surfaces are still within the tolerances necessary to hold the steam where it should be held." For years this railroad has led the world in locomotive performance because of accuracy coupled with finish control.

About this time the growing automobile industry was reaching its potentialities and its production engineers were already dissatisfied with the rapid and uncontrollable wear which destroyed compression after a few thousand miles. Many short cuts to better finish were tried—burnishing by forcing an oversized hardened ball through the cylinder bore, polishing with emery cloth after boring, lapping, etc.—all beset by limitations which doomed them.

The first answer which held promise came with the use of the planetary spindle cylinder grinder which had then been used by the Diesel engine industry for several years. Prior to that time it had been judged by the automobile industry as too expensive a process for mass production automobile manufacturing shops.

Attention once having been focused on the problem, accurate cylinder bores became the target for many ingenious engineers. The result was a really accurate boring operation followed by a honing operation designed to remove the ridges inevitably left by the traversing of the single-point cutting tools.

Objective Yield to Study

For the first time in his history the automobile manufacturer was producing cylindrical surfaces which approached true geometrical accuracy and mileage between overhauls went

A standard method is needed for measuring the quality of finish which modern equipment will produce

Why Should We Control It?

Because:

1. Such control is the logical protection of the total financial investment in the piece.

2. Without control we lack definition for one of the most important elements in the machine tool builder's contract.

3. We allocate production times to the shop and fail to define the one element which vitally influences these times.

4. Without finish control the investment in accurate size is jeopardized.

5. Because practical manufacturers, such as the makers of automobiles, have realized that the buyers of their products invest their money (whether it be $500 or $5,000) in about 0.005 in. of metal, and a high finish is the best protection which they can offer to their customers as a safeguard to this investment.

6. Because undue wear, like rust, wastes money, and wear is to a major extent controllable by attention to surface quality.

7. Because several of the largest manufacturing concerns are offering super quality of surface as an inducement to buy their products and we need a yardstick which every shop man can use.

8. Because in the long run quality rules, and it is time that the vendor of the product which is highly polished (and deeply scratched) be put on the "spot."

9. Because common sense decrees its use. It is easy to attain and its practice is far from costly when weighed against the benefits it confers.

up by leaps and bounds. The 50,000-mile car was here and the refinishing of automobile cylinders as a parasitic but necessary side line was on the way out.

It was on the way out because finish and accurate control at the initial manufacturing operation was producing dividends to the manufacturer in reduced costs—to the user of the car in an increased number of miles at highest gas consumption efficiency. Later developments in the same sphere have demonstrated the practicality of producing highly finished cylinder bores to an equal degree of finish and accuracy by means of the high speed multi-spindle boring machine equipped with tungsten carbide tools which virtually wipe out all surface imperfections by their fine feed and rapid overlapping travel. Despite this progress nothing is accepted as the ultimate. Examples of improvement in finish and the accompanying benefits to life and performance are legion throughout manufacturing industry. Probably no one circumstance speaks so eloquently of the results achieved as the label we now find on our new $600 car which tells us we can drive it away from the show room at 50 miles an hour without fear of permanent damage to its vitals. This is the aspect of finish control which directly affects the man in the street. He no longer has to nurse his new car through its first thousand miles and perhaps ruin it in the process of imparting a finish to its wearing parts, a process which was always hazardous and particularly expensive to the fussy one who changed his oil as often as he found it discolored with particles of cast iron and steel.

Next to horsepower per pound of dead weight, the airplane engine is dependent on its internal finish for efficiency of performance between overhauls.

Gage blocks are logically enough given the highest attainable finish to preserve the minute accuracy which is the mission of their being.

While the highest attainable finish with no potential wear is the goal, it is one of those perfections denied to most of our efforts—hence we need a yardstick and a scale of values to our finishes which will tie in performance with cost or commercial ability. This is the objective of the ASA sectional committee sponsored by the A.S.M.E. and the S.A.E.

Roughness Measurements

Intensive discussion by committees whose members include representatives of leading manufacturers have brought out many interesting points. It seems to be generally agreed that roughness can be measured both by the depth of the tool marks and by their frequency as the latter affects the amount of bearing surface. This might be modified to read "depth and percentage of bearing surface."

One large builder measures depths by placing a straight edge along the surface and bringing the hair line of a universal measuring microscope to the tops and bottom of the tool marks. Other methods include two types of profilographs, binocular microscope, projection microscope, and in terms of the air space between a sample and a smooth support.

Several suggestions have been made as to methods of designating different grades of finish. Some have advocated letters or symbolic figures. It seems best, however, to designate grades by actual measurement so that any classification shows exactly what finish is means. Thus 0.IM would mean 0.0001 in. as the deepest tool mark. Seven classifications are suggested, 0.0001, 0,0002, 0.0005, 0.001, 0.002, 0.004 and 0.008 inch.

All branches of the machine industry are realizing the need for standards that can be specified as definitely as measurements. So far the methods used are comparative rather than being positive measurement. But there is little doubt that a measuring method can be found if sufficient time and effort are applied to the problem. With the growing demand for workable standards of machine finishes there should be no delay in pushing the work to a practicable conclusion.

Studies of a fundamental nature have been started and much progress has been recorded. Now, however, funds are required to continue the research in calibration, all work hitherto having been done on a voluntary basis.

FIXTURES for Multiple Clamping

B. SPECTOR

A little figuring is needed to equalize pressure when a plurality of pieces is included in one set-up

WELL KNOWN to tool designers is the fact that a plurality of pieces, set up to be machined, can be clamped with a single knob in one operation regardless of variation in size or stiffness of some parts. Objectives sought in designing fixtures incorporating this principal are: (a) Every piece should be held with the same pressure and (b) For a given applied pressure, the cumulative pressure on the parts shall be a maximum. To make the total pressure maximum x, in all figures, must be minimum in proportion to the length of the main lever.

In the illustrations, the pieces to be clamped are designated by the symbols W_1, W_2, etc. They are located in V-blocks and are clamped by rockers R_1, R_2, etc. Referring to Fig. 1, rockers R_2 and R_3 are pivoted to the ends of rocker R_4 and rockers R_1 and R_4 are pivoted to the ends of rocker R_5, which in turn is pivoted to the clamping lever A. In clamping all pieces, equilibrium is established by moments of parallel forces. The first two pieces, W_1 and W_2, are held by rocker R_1, and it is obvious that if both these pieces are to be held with the

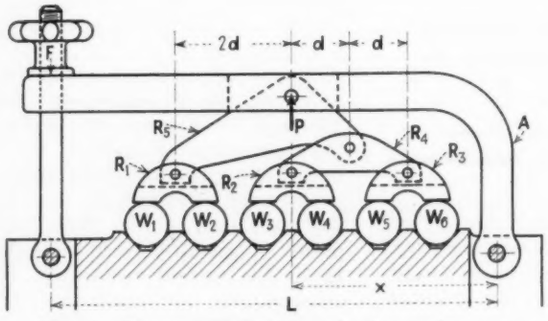


Fig. 1—Correct proportion of the rockers is required to insure that equal clamping pressure is applied to each of the six pieces

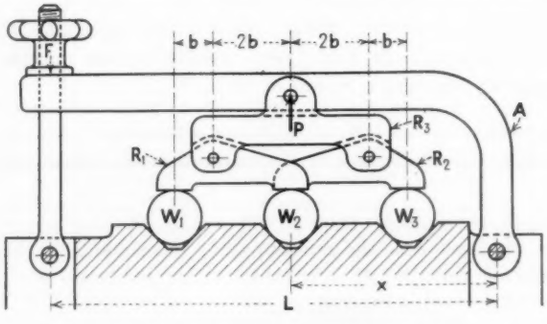


Fig. 3—In designing such a fixture it must be considered that one end of each rocker bears on the center piece

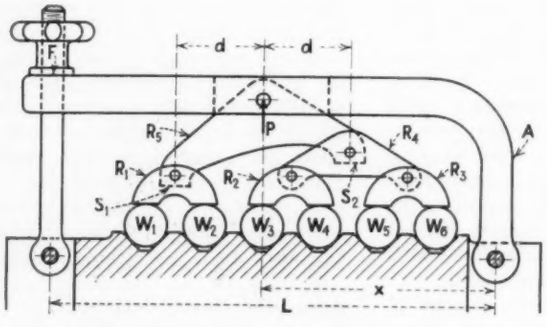


Fig. 2—Equal lever lengths do not necessarily mean equal pressure on the work

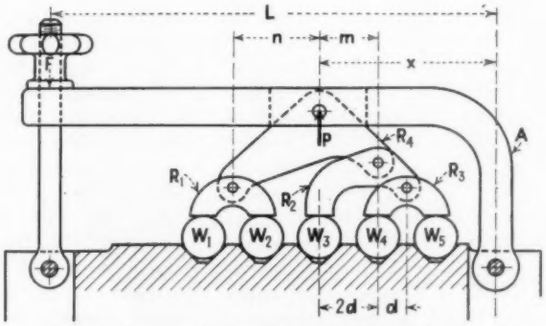


Fig. 4—The number of pieces under each end of a lever has a bearing on the length of the arms

same amount of pressure, the pivot on rocker R_1 must be equidistant from them.

The equal division of all rockers actually led to the error illustrated in Fig. 2, where rocker R_5 is equally divided, despite the fact that its right-hand end holds down four pieces through rockers R_3 and R_4, while its left-hand end holds down but two pieces through rocker R_1. Likewise in Fig. 3 where piece W_2 is held by one end of both rockers R_1 and R_2, which are proportioned in the ratio of 2 to 1.

From what has been said it will be seen that levers or rockers can be so proportioned as to get equal pressure on two, three (or a multiple of three) or four pieces. But how about five or seven pieces? An understanding of the theory of moments of parallel forces is necessary for the application of equal pressure on any number of pieces, and to obtain maximum pressure thereon.

Referring to Fig. 3, assume that all the pieces held down are made of soft rubber. Under pressure they will flatten out into ellipses with the major axes horizontal, and their cumulative reaction is equal to P. Newton's fundamental law that "Action and reaction are equal and opposite," is most simply illustrated by moments of parallel forces. All levers or rockers in the illustrations are beams in the full sense of the word. Let F_1 and F_2 be forces acting on the beam B in Fig. 6. The reactions can then be found by the formula: $RL = F_1 \times X_1 + F_2 \times X_2$. Thus in the other illustrations, $FL = PX$ where F is the force exerted by the clamping screw and P is the total reaction by all "rubber" pieces.

Since $P = \frac{FL}{X}$, it is evident that P is a maximum when X is a minimum.

Rockers as Beams

It was shown above that because rocker R_4 in Fig. 2 is equally divided, the two pieces W_1 and W_2 will each receive twice as much pressure as will each of the four pieces W_3 to W_6, for which reason Fig. 1 was substituted for Fig. 2. In Fig. 3 is shown a method of proportioning the rockers R_1 and R_2 so that the middle piece W_2 receives one-half pressure from each rocker, thus having the same total pressure as pieces W_1 and W_3.

To facilitate proportioning leverages, all rockers, as well as the clamping lever A were referred to as beams. The method of figuring as referred to in Fig. 6 applies to all the illustrations. Based on this method, the following data are given, where N represents the number of pieces to be clamped:

$N = 2$. Use Fig. 2. Pivot rocker R_5 directly to the clamping lever A and put the ends S_1 and S_2 on the work.

$N = 3$. Use Fig. 3.

$N = 4$. Use Fig. 1. Pivot rocker R_4 directly to the clamping lever A and put rockers R_2 and R_3 on the work.

$N = 5$. Use Fig. 4 and proportion $m : n = 2 : 3$.

$N = 6$. Use Fig. 1.

$N = 7$. Use Fig. 5 and proportion $p : q = 3 : 4$.

If N equals 8, the arrangement is the same as for four pieces. If N equals 9, it is best to divide into groups of 4 and 5 and follow the scheme as for N equals 7. Such divisions of N as $\frac{N-1}{2}$ and $\frac{N+1}{2}$ will give the best arrangements.

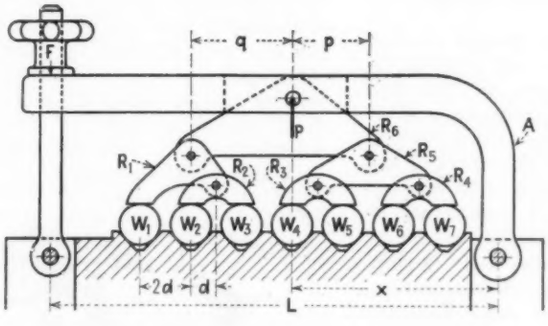


Fig. 5—Pressure may be equalized for both odd and even parts by following the basic law of moments

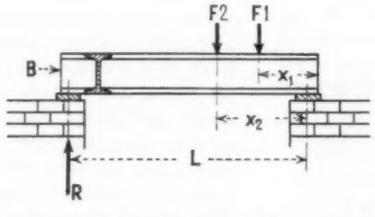


Fig. 6—A simple beam illustrates how the proportions of levers may be computed

How to File Long Tracings

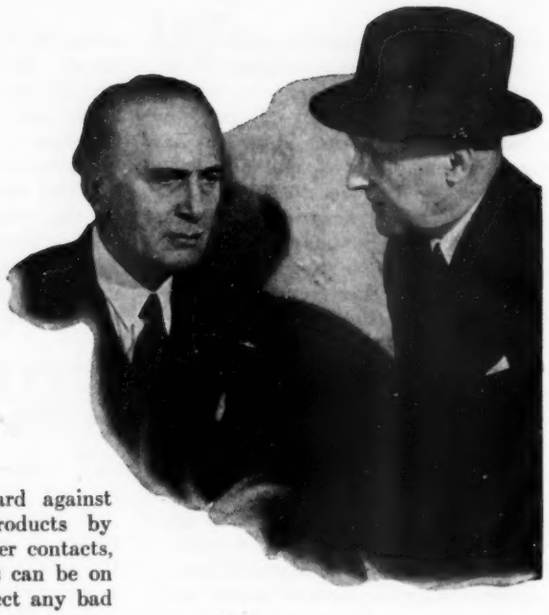
C. G. WILLIAMS

In response to the request for suggestions on how to file long tracings (*AM*—Vol 80, page 328) I have seen several ways of handling them. One firm rolls up long tracings and files them in metal containers that are placed vertically in racks. On the top of the container is a tag with the necessary information.

Another firm folds long tracings into length of 36 in. so as to file flat in the regular filing cabinet. On the back of each fold, lower right hand corner, is a standard form for the title. Thus, no matter how many folds, the information can be caught at a glance without more effort than lifting up a corner of the tracing. These are filed in numerical order, the most recent being uppermost.

Another firm files such tracings in special cardboard containers in which supplies of velum are received. Here also the tracings are rolled and the top of the container is given an appropriate mark. These containers are quite easily damaged along the sides and bottom joints so that oftentimes the rolls become exposed and sections are almost ruined before the container is renewed.

Talking Shop



Export Quality

From letters that are coming in to our office it is evident that export business in machinery is getting back to what would have been considered a normal proportion of the total sales in the days before the depression. One

of the primary causes for this improvement is undoubtedly the frantic preparation for military defense which is monopolizing the facilities of plants in several countries. This is not to say that all of the equipment being shipped abroad is going to be used for military purposes or for defense. Much of it unquestionably is going to commercial enterprises that have not been able to secure equipment of local manufacture because the local shops have been busy on the defense program.

Whatever the reason for the return of export orders to their accustomed volume, those of us who are filling the orders want to remember that only the best in the way of quality should characterize what we send abroad. When it comes to new equipment there is not much reason to expect any difficulties of this sort because American machinery builders take pride in the quality of every unit they turn out. But it happens that a good deal of the equipment that is going out of the country is used or rebuilt machinery. Controlling the quality of rebuilt equipment is a whole lot harder than maintaining the quality of new equipment, as Lewis M. Lind of the Commerce Department Machinery Division points out in a current issue of World Machinery News, monthly publication of his Division. He suggests that machinery builders may help to guard against the export of inferior products by working through their dealer contacts, also that trade associations can be on their guard to help to correct any bad situation that develops.

It takes many years to build up a good reputation for steady maintenance of high quality. On the other hand it takes just one "lemon" to destroy this reputation whether the original builder of the bad order machine had anything to do with the sale or not.

Engineer Order Clerks

Speaking of orders reminds us of a complaint made by a well known machine tool builder not so long ago. His business is practically as good as it was in 1929 and his shop is working two shifts to get out the orders. When he dug into the situation to find out why things were not going through as fast as he thought they should he found that the bottle neck in production was his order department.

The reason for the delay here was that so many technical variations in the product are available that almost every order had to be checked with the engineering department by the order clerk before he dared put the order through to the production department. With a big volume of orders coming through there were not enough hours in the day to get all this checking done. The solution of the difficulty, of course, was to shift enough engineers to the order department so that the questions on variations could be answered at once.

Electrical Dog Houses

One of the things that complicates machine tools of today is the electrical equipment that has to go on them, much of it special because of the demand from the customer. We were walking through the assembly of a machine tool shop a day or so ago with the works manager and admiring the activity and the attractive finish on the product nearing completion. Then we came to a small machine with a pressed metal housing on the back just about half the size of the machine. In it were contactors, relays and yards and yards of wire.

"Look at that dog house," complained the works manager. "It would spoil the looks of any machine tool. Why can't they design electrical control to go inside a reasonable space?"

This works manager would be the last one to recommend abolition of electrical control equipment because he knows it is vital to the operation of a modern machine tool, yet it does seem at times as though more ingenuity could be shown by the designer in getting this auxiliary equipment into smaller space. Take the design of a well known surface grinder, for instance. The motors and control equipment are all readily accessible yet every one is within the space bounded by the floor plan of the machine. —*Editors.*

DIE DESIGN and DIE MAKING

XIV — A single-action drawing die and a combination blanking and drawing die are examples of tools for shallow work

E. G. MARSHALL
Master Mechanic, Charleston Works
The American Fork & Hoe Company

SUCH shapes as cups and shells are produced from flat blanks by means of drawing dies. The flat blank is forced through an opening or into a cavity so that the desired shape is produced. Drawn parts need not be confined to circular cups or shells, but may be square or rectangular, or a combination of straight and curved portions. Moreover, the walls may be straight or tapering.

No fixed rules can be laid down in connection with drawing dies. The depth of the draw, the properties of the stock and the speed of the press operation are some of the factors that must be taken into account when laying out the dies.

Metal selected for drawn work must be ductile and yet have great tensile strength. Some mills offer a special deep-drawing steel in which an extra operation called "skin rolling" provides the metal with a firm skin to resist the tendency to wrinkle while the center is left soft.

The speed at which the metal is drawn is a cause of fracture or tearing. Other factors contributing to this failure are incorrect radii on the punch and in the mouth of the die, and the clearance between the punch and die.

Shallow drawing is not likely to cause wrinkling of the metal, but in deep drawing it is a serious difficulty. The cause of wrinkling is that the metal flows into the draw in a radial direction. When a flat blank is drawn into a cup, the volume of metal must shrink as much as 30 per cent or the stock will wrinkle. Therefore, metal must be held back from the draw by using a pressure pad on the outer part around the punch, and only enough material allowed to flow in to give a shell of the correct thickness. The pressure applied to the pad holds the blank by friction, and the metal is placed under tension by action of the punch. Stretching of the metal follows and the extra 30 per cent not required is held back so that it flows in after the rest of the draw. With this procedure only slight wrinkles occur at the top edge.

Although no fixed rules can be laid down for construction of drawing dies, experience has shown that certain rules of thumb may be followed safely. For example, the radius in the die block over which the metal is drawn should be at least four times the thickness of stock. Also, the wrinkles will be ironed out if the clearance between the punch and the hole in the die is made equal to the stock thickness. Whenever possible, it is best to develop the blank in the drawing die and allow enough metal to trim off the edge that has wrinkles. If a sharp corner is desired, use a second operation and bulldoze the metal back into the corner. All working surfaces of the tool must be glass smooth.

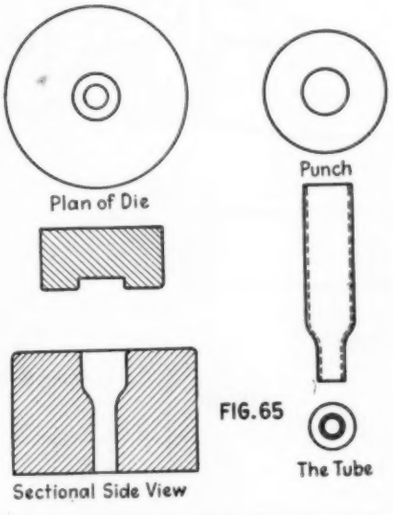


FIG. 65

Fig. 65—Blocks attached to a sub-press are used to draw down the end of a tube

Tools for drawing down the end of a tube are shown in Fig. 65. The part is ¾ in. diameter brass tubing with a 3/64 in. wall and cut to length in screw machines. When finally finished the piece forms the swinging arm for a small portable phonograph. The large end fits the pivoting elbow and the small end fits the reproducer or sound box. Blocks for drawing down the tubing are shown. They are mounted on a sub press. The upper block is recessed to hold the top end of the tube in position, while the lower block has an opening made to the tube size at the top and to the finished size at the bottom. Large radii in the lower block allow the metal to change shape slowly. In an operation such as this, the walls become thicker during the closing-in process and the over-all length of the tube increases.

A single-action drawing die is illustrated in Fig. 66. This die was made to produce a bell similar to that used on typewriters and the item-counter bell on adding machines. The circular blank was $\frac{1}{16}$ in. thick, had a center hole and was blanked from dead-soft strip steel. The center hole provides the only location of the part in the die.

In operation, the blank is laid over the locating pin *A* and rests on top of the punch *B* and the pressure ring *C*. By means of pin *D* the pressure ring is held up under pressure by a large spring attached to the lower member of the sub press. This spring is strong enough to keep wrinkles out of the part during drawing.

When the press is tripped, the upper member moves down and the lower face of the die contacts the work above the pressure ring. As the upper mem-

ber continues to move down the pressure ring yields and the punch forces the metal into the die. At the bottom of the stroke the punch and die bottom and iron out the part. When the upper member ascends the knockout plunger *F* ejects the part.

For this die a purchased sub press was selected. The die block *G* was made of wear-resisting, water-hardening tool steel, and hardened and ground. The drawing surface was polished glass smooth. A cold-rolled plug was turned up to the shape of the bell and used as a gage to make the depression in the die block. The block was then roughed out and the plug covered thinly with Prussian blue. The die was then finish-machined to suit the blued plug. The center was bored to receive the knockout plunger *F* which was made of drill rod and hardened. Then the die block was attached to the upper member with screws and dowels.

Punch *B* was made of water-hardening, wear-resisting tool steel with the top end shaped to the inside of the bell. It was mounted on the lower member with screws and one dowel in the center. The pressure ring *C* was made of the same kind of steel and also hardened and ground. Shoulder screws *H* hold it in position on the lower member. These screws were made of cold-rolled steel and finally casehardened.

Drill rod was selected for the pressure pins *D*, the top end of which are a drive fit in the blind holes on the lower side of the pressure ring. The lower ends extend 1/32 in. below the die shoe when the pressure ring is in the up position. A tapped hole in the center and underneath the die shoe holds the stud for the spring that operates the pressure ring.

A combination blanking and drawing die for use in a double-action press is shown in Fig. 67. The part was made from 0.040 in. thick cold-rolled steel, annealed to a dead-soft condition. The finished part is 1¼ in. outside diameter and 1 in. long. Stock is run through in strips. The ram of the press moves down and blanks the part and then moves down farther to pinch the blank on top of the drawing ring. The center plunger then continues and forces the blank down through the drawing ring, which has a sharp edge on the bottom to strip the part off the plunger as it returns to the upper position.

The sub press was bought outside with a special thick upper member and without any shank. The top side of the upper member was machined to clear the center plunger in its down position.

Die block *A* was made first, water-hardening tool steel being selected. It was shaped to size and the top ground for layout purposes. The center hole in the die block was bored to the blank diameter, the walls being made smooth and straight. The bottom end of the hole was counterbored to allow for a heel on the pressure ring. After clearance holes were drilled for the screws and holes were drilled and reamed for dowels, the die block was hardened and ground.

The drawing ring *F* was made of chrome-vanadium tool steel and hardened and ground. The height of the ring is not important, except that if too short it would be weak and break, and if too long there would not be enough grinding stock on the blanking die block. The outside diameter of the drawing ring was ground to be a drive fit in the die block and the center was bored out to the size of the finished part. A radius of four times the stock thickness is put on the top of the drawing hole for the part to draw over, while the bottom of the hole is left sharp to strip the part. The hole was then ground and lapped glass smooth. The die block was mounted with the hole in the dead center of the sub press.

Blanking punch *G* was inserted into

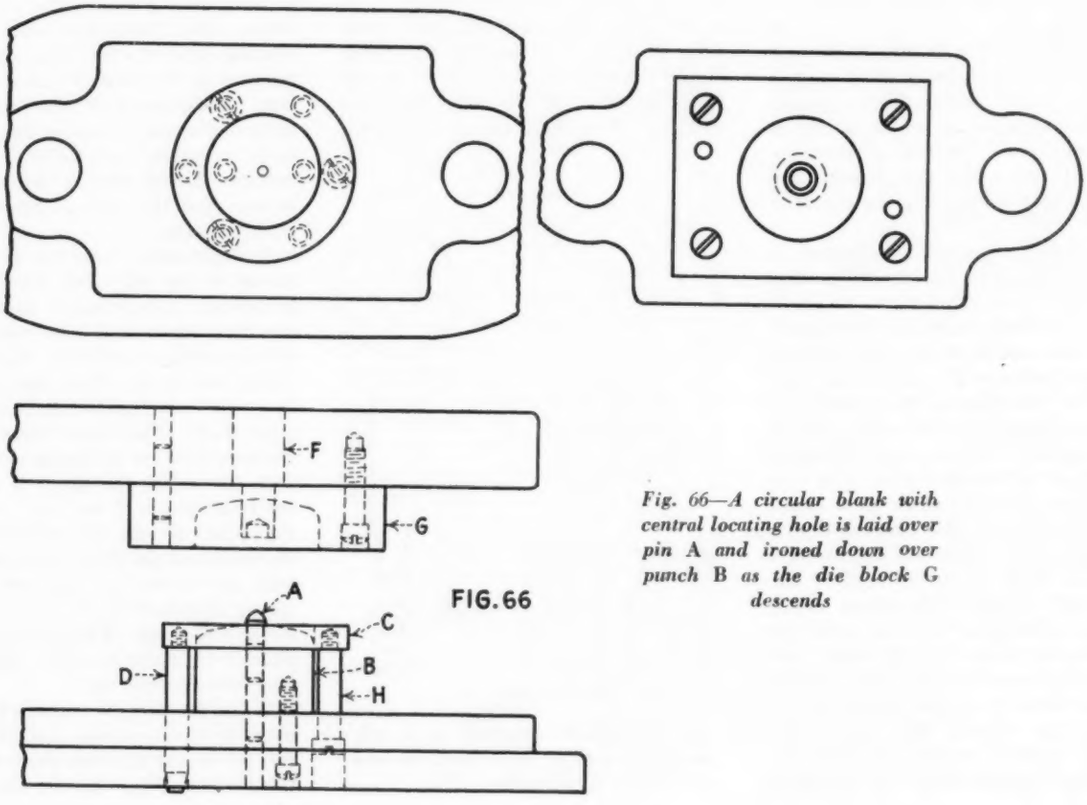


FIG. 66

Fig. 66—A circular blank with central locating hole is laid over pin A *and ironed down over punch* B *as the die block* G *descends*

the upper member with the center in line with the die and then attached with screws. It is also made of water-hardening tool steel, hardened and ground. The outside diameter was ground to allow clearance inside the die block to suit the stock thickness, and the bottom was ground and lapped very smooth so as not to mark the part. Moreover, the center hole was ground a snug sliding fit for plunger *H* at the lower end, and was cleared 1/32 in. at the top.

Tool steel was selected for the center plunger *H*, and hardened and ground. The bottom end was ground to allow clearance in the die block equal to the stock thickness. The end was radiused to prevent fracture of the stock, and an air vent was drilled in the center to prevent an air trap that would bulge the end of the cup. A flange was left on the top end of the plunger *H* so as to attach the adapter *J*. The purpose of this adapter is to connect the second action in the press and the plunger. Before a die of this type is designed, the following data must be determined: the minimum and maximum shut height of both ram and plunger, and the stroke of each.

Part XV of Die Design and Die Making will appear in an early number.

To Avoid Sinking-In Die Sections

JOS. A. FALK
Tool and Diemaker,
Southern Metal Stamping Incorporated

In reference to E. G. Marshall's remarks on the sinking of die sections and backing blocks in "Die Design and Die Making—III," (*AM*—Vol. 80, page 341), from the viewpoint of the small jobbing shop it is preferable to use a socket-head screw of the type designed for work of this kind, than to use the conventional filister screw. It is then possible to build up a sectional die without having to sink the sections in the die shoe, nor to use backing-up blocks. The cost of the die is much lower.

If the drilling, counterboring and dowel reaming are done carefully and the dowels fitted properly, the socket screws will set up by using a ¼x8-in. pipe slipped over the socket wrench. The sections will stay put and there need be no fear of the screws twisting off. These screws have a way of giving off a little squeak when set up tight. One make comes provided with knurled head, making it easy to run it in with the fingers. We are using such screws in sizes from ¼ to ⅜ in. but rarely up to ½ in.

In building-up sub presses we use commercial pins and bushings and cut the steel for the upper and lower members from the slab. Of course, a dowel pin hardened and ground to a tolerance of 0.0002 in. ought to make a mighty fine pin but it would be prohibitive for the small shop. We use commercial drill rod for our dowels, cut off and faced in the lathe and touched up with a No. 6-cut Swiss file.

For dowel-pin reamers home-made tools are made from the same drill rod stock and with three equidistant short grooves filed in and the lips carefully backed off and stoned after hardening. With a little practice it is possible to make a reamer that will provide a smooth clean hole and just the right drive on the pin. In addition, very little lapping is necessary after hardening.

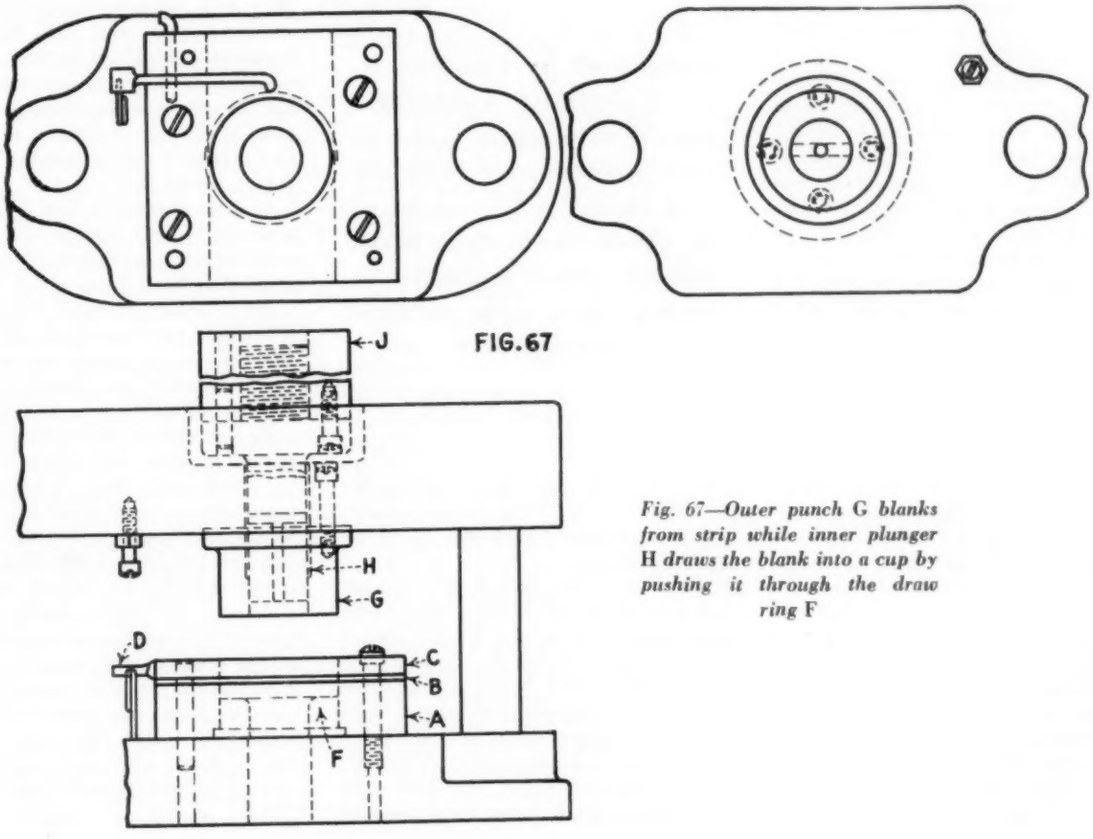
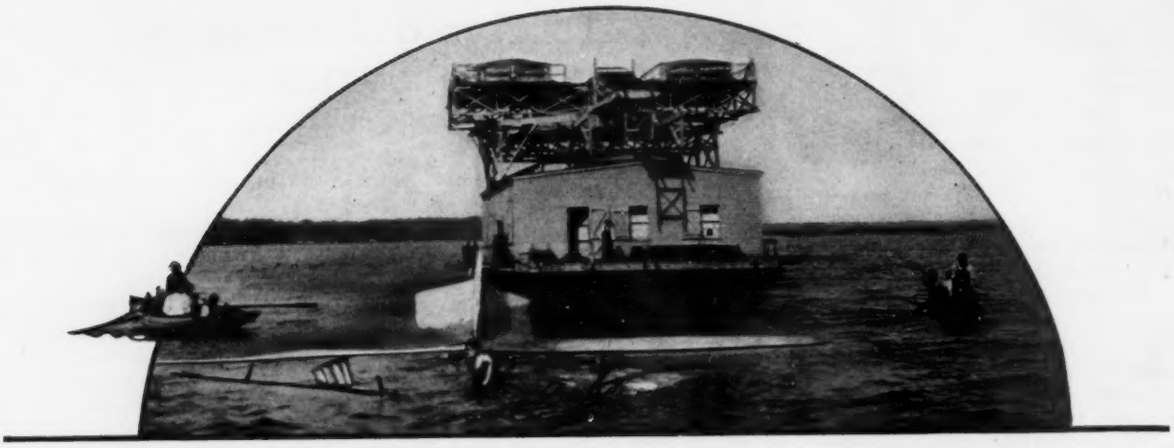


FIG. 67

Fig. 67—Outer punch G blanks from strip while inner plunger H draws the blank into a cup by pushing it through the draw ring F



SKY PIONEERS

XII

FRED H. COLVIN
Editor

Sponsored by the Society of Automotive Engineers, the first aircraft production meeting ever held has just closed at Los Angeles. It shows how this lusty though infant industry is getting into mass production strides

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WITH lathes and machinery installed in what had been the kitchen and dining room of their home in Dayton, Ohio, Wilbur and Orville Wright showed me around one of the world's first aircraft factories I had ever seen. This was soon after their epochal flight at Kitty Hawk, N. C., in December, 1903. Newspapers in general ridiculed heavier than air machines those days, and in fact had stirred up such a strong public sentiment against use of public funds for experiments after Samuel Pierrpont Langley's experimental airplane crashed in the Potomac, that Congress refused to appropriate further funds.

Before my visit to the Wright brothers' "factory," I had seen their test flights from Governor's Island, New York, with the early type of plane having landing skids that was launched by a catapult device. The launching effort was secured by the dropping of a heavy weight in a device which looked like a huge gravity pile driver. My elder son, Charles, then a small boy and who afterward became a prominent factor in the development of aviation instruments, was with me at this time. Needless to say we were both thrilled, though few of us dreamed of the great advances that lay ahead.

Another cherished recollection is that of Glenn Curtiss, who began as a bicycle mechanic, as did the Wrights. A visit to the old Curtiss plant at Hammondsport, N. Y., was a revelation to those to whom the idea of flying was still largely a dream instead of a reality. Perched on the side hill above Lake Leuka with vineyards on every side was a real beginning in airplane construction. Here bluff old John McNamara was the presiding spirit; he developed it into quite an efficient plant after the start of the World War. Curtiss built many planes for the British even though he was apparently discriminated against after we got into the war.

Here I met Lawrence Sperry the daring aviator son of Elmer Sperry, who had recently won the French award for stabilized flying by leaving the cockpit and standing on the wing while the plane maintained a stable flight position. Lawrence was a most likable young man, a family trait incidentally, and I came to know him very well during the war. During the summer of 1916, Lawrence and my son Charles flew almost daily over Great South Bay, testing and working to perfect the gyro-stabilizer. This in its improved form is now the "robot" pilot that is largely used on transport planes in this country. We were all grieved by the death of Lawrence in the English Channel after the war, when the motor of his "flivver" plane failed to function.

I also knew Elmer Sperry, first by reputation in connection with his electrical transportation work in Cleveland, later with his gyro-compass and gyro-stabilizer. We were also together in Japan in 1929 where he was decorated both for his work as an engineer and for his efforts to foster amicable relations between our country and Japan. Unfortunately, he passed away the following spring.

Charles Manley, whom I first knew when he brought out his hydraulic variable speed transmission, was a most interesting man from many points of view. Later contacts ripened the friendship and increased my admiration for him as a man and as an engineer. Going from Hammondsport to Buffalo, where he was then connected with the Curtiss organization, he told me in a most interesting manner of his work with Prof. Langley, whose name deserves grateful consideration by all interested in aviation.

After the successful flight of the model Langley, a federal appropriation was secured to build one that would fly a man, and the question of power became all-important. So, Prof. Langley and Manley went to Paris to see De Dion, who was then building small motor cars, known as "voiturettes." These were small vehicles with wheels on the bicycle order, with a small single air cooled cylinder,

mounted at the center of the rear axle. These were of low power, about the same as on the early motor cycles, and were frequently dubbed "corn-poppers."

But De Dion refused even to consider building such a large engine as they wanted—30 hp. He was fed up on trouble with the development of his small motor and declined the commission to build a large motor—probably with thanks, but very firmly. Otto, in Germany, was the alternative. Although he could, and would, build a 30-hp. engine, the weight made the Otto engine out of the question.

Manley came back to the United States and started to build a single cylinder experimental motor. I well recall the way in which his way of surmounting difficulties fascinated me as I listened. No spark plugs were available, so he made some that would do the trick. To keep costs as low as possible he built his experimental cylinder without a water jacket. Just a plain cylinder with a single wall. For testing it he wrapped it in Turkish towels and had a man keep the towels saturated by running water on them while the engine was in operation. It frequently overheated after two or three minutes, but finding it would run, he built his 30-hp. motor within the weight limit.

Flight a Failure

With the plane completed it became Manley's job to fly it. Tackling such a job took more than being just a good engineer, but Manley was ready. With the plane mounted on a railed runway on top of a barge in the Potomac river, Manley got in and the test was made on October 7, 1903. The result we all know, though until recently I never dreamed that it had been recorded photographically. The picture shows the upper wings and Manley getting clear of the wreckage.

Manley was convinced that had he been able to get into the air he could have flown the plane. He was sure the plane caught on the rails just before leaving the barge and not only checked his speed but turned the nose downward. It was claimed that Glenn Curtis flew the Langley plane years afterward to prove that it was not the failure the world believed. It is generally conceded that the failure of the test, whatever the cause, so grieved Langley that he died of a broken heart.

It may be recalled that a transoceanic flight from here to England was proposed just before war broke out in 1914. Curtiss was building a flying boat for the English flyer, Lieut. John Cyril Porte to make the flight. Rodman Wanamaker backed the proposed flight. Curtiss took much personal interest in the venture and spent some time with men in the shop pointing out the details of the new craft and was nearing completion and was named America. It looked large then, but would seem like a toy as compared with some of the Pan-American flying boats now in use. The war prevented the ocean flight from being attempted, but Curtiss built many flying boats for use in the war which gave a good account of themselves.

Nearby, at Bath, N. Y., where we changed cars for Hammondsport at an early morning hour, I met the Kirkham brothers, who were also among the early engine builders. Their factory comes to mind as closely resembling a barn. They did not become particularly well known, but they built engines that flew, and so deserve a place in aviation development history.

In connection with the Curtiss OX engine, which may be compared to the Ford Model T as being an early design which lasted an unusually long time, there is a recollection that has always been amusing and somewhat significant. I was in the testing room when an inspector for a foreign government came in. One of the engines was making a particularly good showing on the block and he promptly put in a claim for it. The super regretted that it was impossible as it was already assigned. The inspector fumed, but in vain.

When he had gone the super told me the story. "If I'd given that engine he'd have been in hot water at home. He has rejected nearly every part in it, and they bear his reject stamp. I refused it to him to save his own skin."

It was not until early 1915 that I met Glenn Martin in his modest plane plant in Los Angeles. One of the early aviators, he was one of the few flyers who also knew how to build planes. A number of good flyers went to their death in planes of their own design. I saw Lincoln Beachey, an excellent pilot, fly in San Francisco just a few days before his own plane carried him to destruction.

Glenn Martin has made long strides since I first met him in the little shop in a loft in Los Angeles. The insignia of the star and the circle which he used before the war, has been adopted by the army as their own. He has specialized in large planes, such as bombers and large transports for both land and sea. Some of his ships are now flying regularly between Honolulu and San Francisco and will soon link our west coast with the Philippines and China on regular schedule. One of his men, Van Dusen, whom I met as a mechanic, in the Los Angeles shop, was with him for many years.

Revival of interest in hydraulic transmissions, under the guise of "fluid flywheels" in England and in this country in the automobile field, and in one lathe in particular, takes me back to the Manley transmission already mentioned, and even much further back, to the Cooper-Hampton patents in about 1890. The Manley design consisted primarily, of a radial pump connected to a motor of similar design applied to the driven member. Varying the amount of liquid pumped, oil in most cases, gave various speeds to the driven members. The American La France Company used it on some fire engines and on a few trucks.

The Cooper-Hampton transmission is almost ancient history, although few seem to remember it. As I got the story from George P. Hampton, with whom I became acquainted in the early 1890's, it was designed for and applied to street cars in the Twin Cities. Cooper and Hampton were connected with this railway and, in common with all other roads of that day, were having trouble with motors. Railway motors were pitifully small, based on the fallacy that a horsepower and live horses could be used on a par.

Early Hydraulics

To overcome motor difficulties Cooper and Hampton designed and patented a hydraulic transmission that would permit the motor to run at constant speed and would pick up the load gradually. It never got very far, but they evidently had some fairly basic claims as, not very long before the patent expired, the Waterbury Tool Company, who made many hydraulic transmissions for the Navy, bought them to tighten their own claims. This is not hearsay, because at the instigation of H. F. J. Porter, who was also an old friend, I induced George Hampton to sell the patent to them in about 1907.

The Waterbury transmission recalls my first meeting with Winslow Blanchard, in Cambridge. This was before he brought out the grinder that now carries his name into many quarters of the globe. At that time he was running a contract shop, and was building the Waterbury transmission.

And now the Waterbury transmission has been acquired by the Sperry Gyroscope Company in which Elmer Sperry, Jr., also a good friend of mine, is carrying on his father's work.

WHY INDUSTRIAL SALES ARE MADE

HERMAN H. LIND
General Manager,
National Machine Tool Builders' Association

OF ALL the varieties of selling the most interesting and satisfactory type is that of analyzing a plant's requirements for tools and equipment, convincing a man or a group of men that what you propose is best for their purpose, and receiving the definite proof of a good selling job in the form of the buyer's signed order. A build-up of confidence in one's house and its product is not simple; many factors contribute to it —general reputation of the company and its product, its advertising, its sales policies, its representation.

For the purpose of this discussion let us limit the term industry to manufacturing industry, which is very young. Industrial equipment is not an end in itself. It is a means to the end. The end is any one of thousands of products for individual use and enjoyment. Industrial equipment is a part of the service necessary to produce goods for the ultimate consumer.

Within recent years the manufacturer's problems have multiplied because of special conditions imposed by the times. Constant progress in providing for the consumer more and more goods of higher quality at lower costs has made the consumer extremely price conscious. Not only must the manufacturer consider the buyer's demand for greater value for his money, but he must also face the constant trend toward shorter hours of labor and higher costs per hour. Only by better management and the most efficient equipment can the manufacturer who wishes to sell goods in quantity reconcile the opposing trends of these two forces.

In determining the advisability of the installation of new equipment many cost factors must be considered. The initial cost must be amortized, and the manufacturer must estimate a return on his investment, direct and indirect labor costs, floor space and other general overhead items, power consumption, service and repairs, and so on. If after consideration of all these factors he decides the equipment investment will pay, he must then compare the variety of epuipment available and choose the machinery best suited to his purpose, making full allowance for the possibility that a more efficient machine may soon be placed on the market.

Competition for the consumer's dollar which exists among manufacturers of the same product and manufacturers of many different products, is another factor responsible for careful buying today. On every hand are illustrations — automobiles, radios, washing machines, vacum cleaners— which prove that the demand of the people of this country for conveniences and labor saving devices can be increased tremendously if prices are sufficiently low. The manufacturer who seeks a large market has no alternative but the careful choice of equipment, with consideration for the cost and quality of its product. Thus the sale of industrial equipment demands the highest type of salesmanship, which through careful analysis understands a customer's requirements and has the ability to advise him.

Why Plants Grow

Another great responsibility rests upon those of you who sell to industry. By its very nature industrial equipment is cost saving, and to many persons that term is interpreted to mean the elimination of workmen. You who are visiting manufacturing plants every day have seen plants grow and employ more people because the introduction of cost reducing equipment broadened markets. However, the general public has been so misinformed by warped writers and speakers that it is ready to believe labor saving equipment is responsible for unemployment. The contrary fact is that the industries that first emerged from the depression are those which employ the most up to date equipment, while the industries most backward in modernizing their methods have been last to participate in recovery. An obvious example is a comparison of the automotive industry and the building trade.

If the editors of our daily press, if the men responsible for making the laws of the state and nation possessed the true information of what makes the wheels of business go round and what conditions promote employment, very little legislation would be enacted that would worry business men.

Few legislators, editors and reporters have had actual first hand experience in designing, making or selling goods. Their knowledge of industry is gained mostly from accounts of unfortunate labor conflicts. Every effort should be made to acquaint them with what responsible management of industry is really doing. The great proportion of American workmen are working under sanitary conditions and have a surprisingly keen appreciation of the problems confronting their employers, who are likewise sympathetic with the workers' problems.

Urge Plant Visits

It is most important that industry should urge legislators and representatives of the press to visit its plants, learn something of the operations of business, the difficulties encountered, the necessity of selection of sound policies that finance production and promote sales if men are to be continuously employed and paid, and the fact that it is and must be the function of profit to provide a reserve of capital as well as to pay dividends to stockholders. Profits and dividends are not and cannot be synonymous, as so many seem to think, if industry is to continue its service to mankind.

Laws that are uneconomic for business are uneconomic for the people, and it is the duty of business men to make this known to the pepole. Therefore, I feel it is your job as industrial salesmen to do more than simply sell equipment; you must also sell the desire to create and safeguard sound conditions for the continued advancement and expansion of business, for in no other way can this country overcome the desperate problem of today—unemployment.

Presented before the Industrial Marketers' Association of Cleveland Sept. 18, 1936

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 22
K. H. CONDIT • F. H. COLVIN
EDITORS

AN INDUSTRY SPEAKS

1 WE RECOGNIZE the advantages of business competition under a Democratic form of government and under the American standard of living, and pledge ourselves to adhere to this principle in an energetic but clean and honest manner.

2 WE BELIEVE that our industry is unalterably tied in with the welfare of other industries and other lines of endeavor, and pledge ourselves to be tolerant in our attitude towards them.

3 WE BELIEVE in the advantages of cooperative effort, and therefore pledge our utmost support to our own Association, and to such other national or local organizations as are honestly and legitimately endeavoring to raise the standard of living.

4 WE BELIEVE in our Democratic form of government as provided for in the Constitution of the United States, and pledge ourselves to take an active interest in national and local political affairs.

5 WE BELIEVE in the profit system and pledge ourselves so to manage our business that the greatest value will accrue to investor, workman and consumer.

6 WE REALIZE the damage done to our competitors and the general economic structure through the marketing of a product at prices below normal costs, and pledge ourselves to discontinue products which do not have a promise of showing reasonable profits.

7 WE RECOGNIZE the value of maintaining a sound partnership with our workers and pledge ourselves to strive continually to improve their conditions.

8 WE RECOGNIZE the fluctuations in world economic conditions causing periods of prosperity and depression, and pledge ourselves to do our part in helping to balance production and consumption.

9 WE PLEDGE OURSELVES to common decency in business as expressed in our own Code of Ethics, believing that adherence to the principles therein will lead to a better understanding of our industry, freedom from unnecessary friction with our competitors and our customers, and a business standard above reproach.

10 FINALLY, WE REALIZE the important place our industry enjoys in the American standard of living and in human welfare generally, and pledge ourselves to strive for even higher standards so that this position may be maintained.

From the presidential address of NORMAN D. MACLEOD *before the National Machine Tool Builders Association at Hot Springs, Va., Oct. 5, 1936*

New Industry No. 19

SINCE 1879, eighteen new manufacturing industries have been created. By 1929 they accounted for 1,123,000 jobs, nearly one-seventh of the labor employed that year in all manufacturing industries.

The output of the shops represented in these groups has added enormously to the real wealth of the nation. Automobiles, electrical appliances, typewriters, radios, to name only a few of their products, have enriched the lives of many people.

These industries still need men—men with ambition to get ahead and willingness to render loyalty to their employers. But in many sections of the country, such men are hard to find; and this in the face of eight to ten million still reported unemployed.

True, lack of training accounts for part of the gap between unfilled jobs and men to fill them. This is currently being corrected by industry, as individual concerns or through community plans.

But there is another influence, far more powerful, that prevents the absorption of the unemployed. This might be called new industry No. 19, or living on the government. Relief and W.P.A. are furnishing a means of livelihood that overshadows any private enterprise.

Most of us know of instances where unemployed individuals have refused work, casual or permanent, because of the fear of going "off relief." The old necessity of turning one's hands to ward off hunger and cold is gone and with it some of the traditional resourcefulness of American labor. It would appear that as long as federal largess is distributed as loosely as at present, industry No. 19 will play a big part on the American scene.

Relief and W.P.A. are to all purposes unproductive. They are parasites living on taxes taken from other industries and their employees. They tend to lower rather than raise national wealth and standards of living. It does not take an economist to see that no nation can consume what it does not produce. The diversion of employable workers from productive channels to secured idleness bids fair to become our greatest national problem.

Business has revived; it is demanding more men. The problem can be solved if attacked quickly and forthrightly. But it takes courage and a denial of minority pressure groups who would continue a system that makes federal dependents of a large section of this country's population.

Chips

WASHINGTON—Major parties open heavy campaign firing as candidates swing across country speaking to "capacity houses," and Alfred E. Smith, Col. Frank Knox, Senator Borah, Father Coughlin and Dr. Townsend share front pages with principals. . . . Department of Commerce drafts plan to aid trans-Atlantic lighter-than-air shipbuilding in order to encourage U. S. passenger ventures as Dr. Hugo Eckner entertains leading U. S. financiers aboard the Hindenberg on junket at close of successful season.

FOREIGN—League of Nations begins fight against world trade barriers. . . . Spanish rebels close in on Madrid while powers quarrel over Soviet charges of German, Italian and Portuguese aid to insurgents, nearly breaking up London non-intervention session in a brawl. . . . Mussolini reports to Italian cabinet that $630,000,000 rearmament program is now under way; several factories are being modernized with new machinery and additions to build latest type of aircraft engines and a number of airports will be established. . . . Great Britain and France join U. S. in reciprocal pact to buy and sell gold through central bank.

FINANCE—Italy devaluates lira 41 per cent, in line with Anglo-Franco-American policy of leveling off currencies to pre-war relationships. . . . U. S. Internal revenue collections rose 6.7 per cent in 1935-36 fiscal year.

INDUSTRY—Rail news best since 1930, with new depression highs in gross revenues and earnings being reported by most lines. . . . Industrial corporation reports continue to show marked gains. . . . Locomotive orders booked near 250 for year, best since 1930, with Baldwin new business doubled during year. . . . Backlog of steel orders highest since 1929. . . . Longshoremen and Atlantic ship lines reach agreement. . . . John L. Lewis, C.I.O. chief, and William Green, A.F. of L. president, unbend and talk things over, probably under heavy pressure from political sources. . . . A.F. of L. reports 2,216,000 unemployed have found work during first eight months, mostly in building trades.

TRADE—Advertising volume is 15 per cent ahead of 1935. . . . Plans for spending $125,000,000 for 1939 World Fair in New York approved. . . . Nine months' retail trade in New York state is 22 per cent more than in 1933, but under 1929 volume, U. S. Bureau of Census finds. . . . Chain store sales gain heavily, Sears, Roebuck sales for past four weeks up 26 per cent, an all-time high.

INDICATORS—Steel production at depression peak, reaches 75.9, with best last quarter orders since 1929. . . . Freight carloadings again up, highest since 1930. . . . Electrical output holding its all-time high. . . . *Business Week* index at 76.7, off about 1 point for week, holding to September's average.

Machine Tool Builders Discuss Foreign Markets and Local Laws

Members of the National Machine Tool Builders' Association at their 35th Annual Convention held at Hot Springs, Va., October 5-7, listened to first-hand accounts of conditions in Germany, Italy and Great Britain, and to address on matters of domestic concern. F. H. Chapin, president, National Acme Co., whose products are built in Germany under a licensing arrangement, commented on the improvement in the German economic situation during the past 6 months, and told of plans to refund defaulted industrial and municipal loans. He expressed the opinion that Germany has the most effective fighting force in the world today, and remarked that she is pinning her faith on the airplane rather than on fortifications. He described in some detail the gas-proof air raid refuge required by edict as a part of an addition to the plant of his licensee. It will accommodate 2,200 people who can take refuge in it within 5 minutes.

S. T. Massey, vice-president, Heald Machine Co., described Italian conditions as being in a state of change so rapid that forward planning is almost impossible. The cost of living is rising, and wages are up 5-10 per cent. Germany has a preferred trade position because of a commercial treaty recently concluded. Italy is expanding her machine tool manufacturing and is copying American tools.

England, according to J. E. Lovely, chief engineer, Jones & Lamson Machine Co., is importing much more machinery than she is exporting, and the amount is double what it was in 1929. Sixty per cent of the business is coming to the United States. Slow deliveries have kept the Germans in second place. England today is building half the world's ships and is actively engaged in industrial building construction. As a defense measure, duties on imported equipment are rebated when it can be shown that local sources cannot supply equivalent products in time to enable the buyer to meet contract requirements.

First Vice-President

Bachrach

HOWARD W. DUNBAR

President Norman D. MacLeod in his opening address proposed a platform for the industry which met with general approval. It is reproduced on page 888a of this number.

After reviewing the harmful possibilities of the Walsh-Healey, Patman-Robinson, Social Security and 1936 Revenue Acts, General Manager Herman H. Lind said:

"As costs are increased and production made difficult by legislative action every attempt will be made to compensate so far as possible by better processing and better management, and the machine tool industry will be called upon to take up the burden, to provide the facilities and equipment to produce things people will buy in good quality and at low cost. The task calls for the highest degree of inventive genius, productive ingenuity, strong and certain sales methods, in fact,

New President

Blackstone

CLAYTON R. BURT

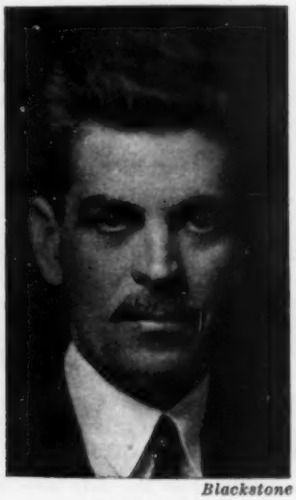
Second Vice-President

N. A. WOODWORTH

Chosen N. M. T. B. A. Directors

Blank & Stoller

ALBERT J. GIFFORD



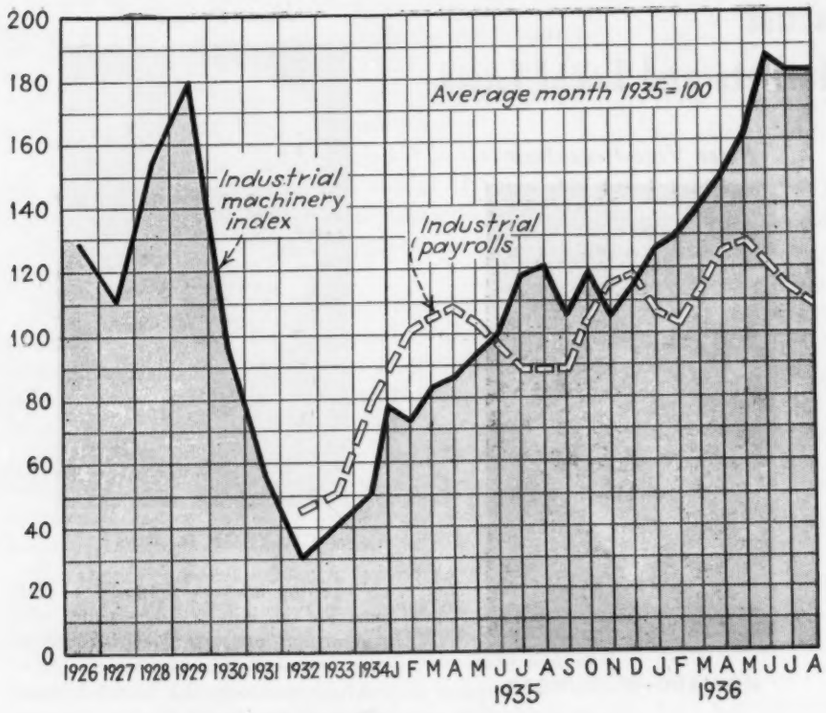
Blackstone

T. H. DOAN

Reelected Treasurer

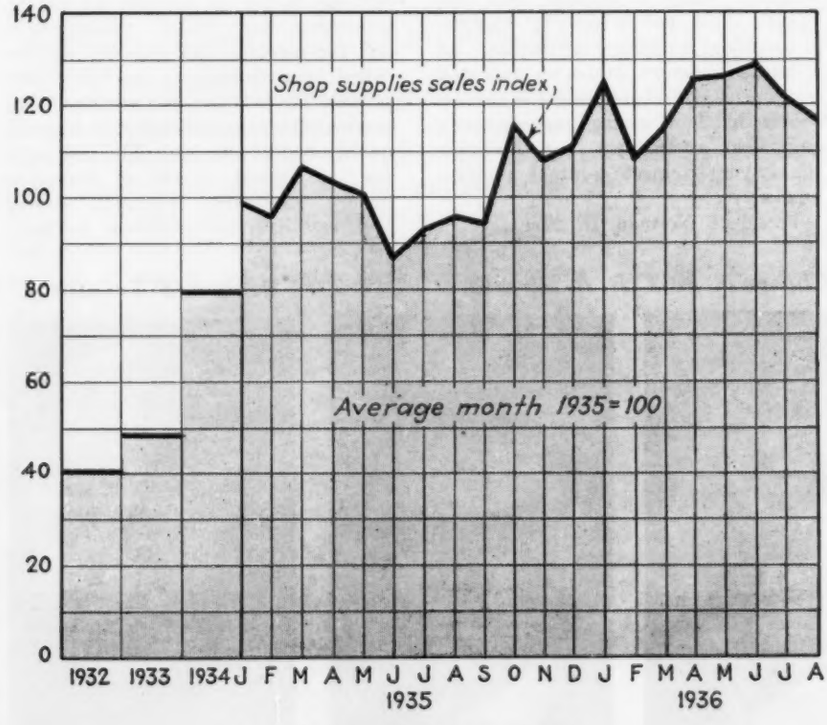
Kalden

H. C. PIERLE



Orders for Industrial Machinery

Final figure for July is 10 points above the preliminary estimate and stands at 182, on a level with the August preliminary estimate



Sales of Shop Supplies

August's final figure recedes somewhat from the July level which was also below that of June

every functional element of the best in business management. So far the industry has proven it is able and willing to asume the load. It must carry on."

The following were elected directors to serve for three years: N. A. Woodworth, president, Ex-Cell-O Aircraft & Tool Corp.; T. H. Doan, president, Foote-Burt Co.; A. J. Gifford, treasurer, Leland-Gifford Co. The new board organized by electing as president Clayton R. Burt, president, Pratt & Whitney Co.; as first vice-president, Howard W. Dunbar, manager, Grinding Wheel Division, Norton Co.; as second vice-president Mr. Woodworth. H. C. Pierle, secretary and sales manager, R. K. LeBlond Machine Tool Co. was re-elected treasurer.

Indexes Still High

Despite the approach of Election Day and the disturbing effects of a keenly contested political battle, both of the *American Machinist* indexes are holding up well. The index of industrial machinery sales stands at 182 for July, and the preliminary estimate for August with only one factor missing is at the same level. The index of sales of shop supplies has dropped again for August, standing at 116.4 as compared with 121.4 for July and 129 for June. By comparison the curve of industrial payrolls is lagging, possibly because transportation payrolls have been added to manufacturing payrolls. It has shown reasonably good coordination with the shop supply curve, not so good coordination with the machinery index.

Workers' Economic Status Has Improved Since 1914

National Industrial Conference Board Issues New Study

Considerable improvement in the economic status of American wage earners since 1914 is shown in a study just published by the National Industrial Conference Board, New York. The study, "Wages, Hours, and Employment in the United States, 1914-1936," shows that average hours of work in manufacturing are approximately 23 per cent lower than they were in 1914, while average weekly earnings in June, 1936, after adjustment to take into account changes in the cost of living, are shown to be 39 per cent higher.

The status of women workers improved more than that of men.

A. S. T. M. Approves Rivet Material Specifications

Bolting Materials for High Pressures Also Passed On By Committee

The American Society for Testing Materials Committee E-10 on Standards approved as tentative, specifications covering high-strength rivet steel (A 195), seamless steel boiler tubes and super heater tubes for high-pressure service (A 192), alloy-steel bolting materials for high pressure at temperatures up to 1,150 F. (A 193) and nuts for bolts for high-pressure and high-temperature service to 1,100 F. (A 194). Steel provided for in the high-strength rivet specification is a carbon manganese silicon type with carbon on ladle analysis not over 0.30, manganese not over 1.65 and silicon not over 0.25.

Specifications for steel nuts cover five grades of material for services varying in degree of severity. Alloy-steel bolting material specifications for high-pressure and high-temperature service to 1,100 F. (A 193) cover five classes of steels. Data relative to the chemical and physical properties of several alloy-steel bolting materials, in addition to these given in the body of the specifications, is included. The data given are tentative and the committee plans to revise them.

Committee A-3 on Case Iron, has approved as tentative standard definitions of terms relating to cast iron. Cast iron is defined as "iron containing so much carbon that, as cast, it is not usefully malleable at any temperature. It usually contains from 1.7 to 4.5 per cent carbon and in most cases an important percentage of silicon."

ENGINEERS' COUNCIL ELECTS

CHARLES F. SCOTT, professor emeritus of electrical engineering, Yale University, has been reelected chairman of the Engineers' Council for Professional Development, 29 West 39th St., New York, H. H. HENLINE, secretary, American Institute of Electrical Engineers was again chosen secretary. R. I. REES, assistant vice-president, American Telephone & Telegraph Co., was named assistant chairman, and C. E. DAVIES, secretary, American Society of Mechanical Engineers was chosen assistant secretary. Executive committee members are J. P. H. PERRY, F. M. BECKET, C. F. HIRSHFIELD, L. W. W. MORROW, H. C. PARMELEE, R. I. REES and D. B. STEINMAN, representing the major engineering societies which comprise the Council.

Society for Metals President

Bachrach

EDGAR C. BAIN

New officers inducted into office at the annual meeting of the American Society for Metals, Oct. 21, Cleveland, were headed by EDGAR C. BAIN, assistant to vice-president, United States Steel Corp.

Other officers are GEORGE B. WATERHOUSE, vice-president; WILLIAM H. EISENMAN, secretary, and W. P. WOODSIDE, treasurer. New trustees are R. S. ARCHER, O. W. ELLIS, R. L. KENYON, S. C. SPALDING and R. L. WILSON.

German Machinery and Steel Works Are Active

Heavy Industries Show Marked Gain, Shortage Reported

Activity in the German pig iron, steel and machinery manufacturing branches of heavy industry is reported to be extraordinarily high, and there is a shortage in basic supplies. The Iron and Steel Supervision Board has forbidden dealers to increase their stocks of pig iron, semi-finished products and rolled goods above the level of 1935. Likewise, the board has ordered smelters to maintain certain minimum stocks of iron ore, manganese ore and scrap. It is understood that the aim of both measures is to insure a market supply of steel.

Heads Atwood

FRANKLIN R. HOADLEY has resigned as vice-president of Farrel-Birmingham Co., Ansonia, Conn., to become president of the Atwood Machine Co., Stonington, Conn.

New York Employment Is At Six-Year Peak

State Factory Index Is Highest Since October, 1930

Factory employment advanced 3.7 per cent and payrolls rose 0.9 per cent in New York state from the middle of August to the middle of September. These increases followed an advance of 3 per cent in employment and 5 per cent in payrolls in the period from the middle of July to August.

The employment advance exceeded the usual increase at this time of year, which is 2.6 per cent. The gain in total payrolls, while less than the average of about 4 per cent, followed a larger than usual advance in August. The gain raised the State Labor Department's index of factory employment to 82.7, or higher than for any month since October, 1930. The index of payrolls rose to 71.7, and was above that of any month since April, 1931. Compared with September of last year, the index of employment was 7.6 per cent higher this year and the index of payrolls 8.8 per cent greater. Metals and machinery advanced 2.5 per cent.

General Electric Stabilizes Wages

Company Will Adjust Pay to Meet Living Cost Index

General Electric Co. this month adopted a wage stabilization plan under which the pay of the firm's thousands of employees will be automatically adjusted with the rise and fall of living costs. A company executive in New York said it "would probably apply to all units throughout the country." There are approximately 40,000 industrial workers at a score of General Electric plants.

The first application of the plan will be effective on October 22 and 23, when a 2 per cent upward adjustment of all hourly and piece work earnings will be made.

The executive committee of the Workers' Council, sponsors of the plan, said the wage adjustments will be based on the United States Department of Labor cost of living index, which now stands at 82.

For every point of rise in the index, which is corrected quarterly, the company has agreed to automatically adjust wages until the index reaches 90. The adjustment will remain constant through each quarter. It will also affect salaried employees receiving up to $5,000 yearly, but will apply only to the first $3,000 of such earnings.

Manufacturing Industry Has Small Debt Burden

Interest Charges Growing Smaller, and Long-Term Charges are Negligible

Manufacturing industry has a smaller debt burden than any other major branch of economic activity, according to the National Industrial Conference Board, New York.

Analysis of the long-term debt of manufacturing industry discloses that from 1900 to the beginning of the depression, the ratio of interest charges to value of output has been growing steadily smaller, and that the long-term interest burden is a negligible item in the manufacturing process.

Even in recent depression years, the ratio of interest charges to revenues in manufacturing industry was very small. In 1933, a year of severe business depression, long-term interest charges represented only 1.5 per cent of revenues or of the net value of manufacturers' sales.

The Conference Board points out that these findings run counter to the belief held by some that manufacturing long-term debt is too great and has been an important cause of maladjustments in the country's economic system as a whole.

KNIGHT SCREW EXPANDS

Additional capacity and room for further expansion is provided the Knight Screw Products Co. by its purchase of the plant of McAleer Manufacturing Co. on Lyndon and Prairie Avenues, Detroit. The company will have double its former capacity.

Promoted by Westinghouse

GEORGE H. BUCHER

GEORGE H. BUCHER, formerly a vice-president of Westinghouse Electric & Mfg. Co., New York, has been elected executive vice-president of the company. His new headquarters will be in Pittsburgh. He joined the company in 1909. In 1911 he joined the export department, and in 1920 was appointed assistant to the general manager of Westinghouse Electric International Co., and later was elected vice-president and general manager.

FIRTHITE PRICES LOWER

Substantial reductions in the price of Firthite sintered carbided, with a base figure of $0.45 per gram, have been announced by Firth-Sterling Steel Co., McKeesport, Pa.

Machine Tool Orders Show First Recession

Ten Month Up-Swing Trend Reversed in September

The National Machine Tool Builders Association announced in Cleveland that "a considerable recession" during September reversed the upward trend in machine tool orders for the first time in ten months.

The association said domestic orders have receded "quietly" since April, adding that approximately 30 per cent of September orders came from foreign sources.

In September the index of total volume of orders dropped to 118.5 from the July high point of 150.

Chevrolet Retooling Cost $26,000,000

Plants in Six Cities Spent One of Largest Sums on Record

A total of $26,000,000 has been spent by Chevrolet Motor Co., Flint, Mich., for retooling, new machinery and rearranging of the plants and assembly lines of the company for production of the 1937 models to be announced early in November.

This was one of the largest sums ever appropriated in the automotive industry for the change-over of machinery for the annual new models, M. E. Coyle, president, said.

The plants at Flint expended $10,000,000 and those in Detroit $6,000,000. In Saginaw, $2,000,000 was spent. Other large sums were used in Muncie, Ind., Indianapolis and Bay City, Mich., and several assembly plants throughout the country.

CELEBRATES LONG TEST

The twentieth anniversary of the American Society for Testing Materials atmospheric corrosion tests on black iron and sheet steel, exposed in 1916 at Annapolis, Md., was observed there Oct. 16 with a ceremony attended by some of the men who were members of the committee. Inspections of the samples have been made twice a year. Identical tests are being carried out in Pittsburgh and Fort Sheridan, Ill.

ON VISIT HERE

EDWARD and JOHN STOKVIS, of the firm of R. S. Stokvis & Sons, Rotterdam, The Netherlands, and Brussels, Belgium, are visiting factories in this country.

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Index of Orders: Foreign	Index of Orders: Total	3 Months' Average Index	% Foreign to Total Orders
1935 — September	54.1	25.9	80.0	108.5	32
October	79.5	23.4	102.9	102.9	23
November	79.2	19.4	98.6	93.8	19
December	78.1	20.2	98.3	99.9	21
1936 — January	95.7	15.1	110.8	102.6	14
February	99.8	12.3	112.1	107.1	11
March	89.0	16.3	105.3	109.4	15
April	110.9	14.8	125.7	114.4	12
May	95.7	23.2	118.9	116.6	19
June	106.5	22.3	128.8	124.4	17
July	104.4	45.7	150.1	132.6	30
August	96.1	31.4	127.5	135.5	24
September	82.9	35.6	118.5	132.0	30

Distribution of Orders

Average Indexes of Individual Companies	Companies in Per cent of Total Number Reporting: 1935 1st Quar.	1935 2nd Quar.	1935 3rd Quar.	1935 4th Quar.	1936 1st Quar.	1936 2nd Quar.	1936 3rd Quar.
200-up	40.2	5.8	14.2	11.3	13.0	17.2%	15.8%
100-199	12.5	15.8	22.1	24.3	24.6	32.6	28.8
60-99	16.9	22.0	17.2	21.7	22.4	19.0	22.9
20-59	39.6	31.2	31.6	27.7	26.5	21.8	21.7
Less than 20%	26.8	25.2	14.9	15.0	13.5	9.7	10.8

Watching Washington

Candidates active in closing campaigns . . . Recovery vs. waste is uppermost issue . . . Labor Department plans Walsh-Healey administration . . . Gold pact an experiment in international currency control

WASHINGTON—Most people have made up their minds on their politics—and positively. Characteristic of the American electorate, and of few others, citizens express their thoughts with vigor but without vitriol.

This freezing of opinion does not mean that the candidates have abated one wit in their efforts to swing the few remaining swingable votes. All contenders for office are going hammer and tongs after the mugwumps who are still undecided as to which side of the fence they will light.

Candidate Roosevelt's arguments come down to one premise: He came into office when the nation was "like a train which had gone off the rails into a ditch . . . The wheels of business began to turn again; the train was back on the rails . . . it was pulled out by the government."

Historically this line of contention is a hard one to beat—few persons look at larger principles behind current facts. What do they care if posterity has to pay for present pump priming?

Candidate Landon's line of attack has been to point out the wasteful policies of the present administration. Fostering of favored groups through federal handouts, he claims, was too high a price to pay for the degree of recovery that has followed. Besides, he contends, this course has hampered rather than helped the upswing because of its dampening influence on private enterprise.

Those voters who attempt to adopt a philosophical viewpoint, who say that it does not much matter who gets in, that Roosevelt has completed his reforms and will calm down should he attain a second term, are not backed by the opinions of most Washington observers. The Roosevelt premise, that Washington is responsible for national economics, they say is a basic principle that will work a fundamental change in American government, involving as it does the setting up of preferred minorities. The feeling is that the New Deal program has no more than reached the halfway mark, that it will continue the way it is headed instead of reverting to a more conventional mode of government.

Walsh-Healey Board Set Up

Three officials of the Department of Labor have been named by Secretary Perkins to serve as a temporary board for the Walsh-Healey government contract act. Until Congress appropriates funds to permit its expansion, this board will pass upon requests for exemptions, establish overtime rates, receive complaints regarding violations, and review rulings of various purchasing agencies. It will also be empowered to establish minimum wage rates, after public hearings, in those industries to which this section of the act will be applied.

Appointed to the board were Frank Healy, formerly head of NRS's government contract division; Hugh L. Kerwin, director of conciliation; and Telfair Knight, counsel for the textile labor relations division. Secretary Perkins has requested the U. S. Chamber of Commerce and the American Federation of Labor to nominate technical advisers to present their points of view to the new board on specific practices.

Without admitting that the act does not cover materials entering into products furnished in government contracts, Labor Department officials have no idea at present of making an issue on that score. They have enough trouble as it is. An amendment that would make this clear and preclude use of materials made under sweat-shop conditions will be sought by the American Federation of Labor.

Sharp increases in the prices they have been paying is expected by government purchasing agents as a result of the Walsh-Healey Act.

Three-Nation Gold Pact

While the gold agreement is a technical step, it is significant in that it demonstrates that the United States, England and France are wholeheartedly cooperating. It involves an agreement on the part of the U. S. to sell gold at $35 an ounce to any country that has a stabilization fund used in accordance with the agreement. England will probably have to sell gold for some time to support the pound, and she could not sell until she could buy it back when the tide turns.

There are some who claim that the administration deserves little credit for its part in the agreement, that it is only a correction of part of the wrong previously done. While few contend there should have been no devaluation of the dollar, there is some agreement that it was devalued too much. This school believes that France would not have had to devalue again had the dollar been fixed at 80 to 85 cents.

At any rate the cooperative move means that money can be managed abroad as well as at home. If this can be done a step will have been made toward protecting the capitalistic system against violent inflations and deflations. In itself the agreement does not insure that this objective will be reached for there is much to learn before real stability can be achieved.

So long as the prospect of the gold bloc's collapse hung over world trade, there was hesitancy to venture far into that field, but now that the bars are down confidence seems to have returned with a rush. Cablegrams to the Department of Commerce tell of prospects for increased sale of American industrial machinery, electrical equipment, chemicals and a list of other products. Imports are already reaching a point where the all-necessary buying power is being built up.

England, grimly engaged in rearmament, will require more American goods as time passes. English builders, working full blast on home orders, are forced to give way in colonial and other markets. In some cases Britain is now admitting machines free or reduced from the normal 20 per cent duty by discretionary power when they are not obtainable at home in a reasonable time. The acute situation is in machine tools.

Australia, which has been restricting American goods to balance trade, may turn here for machines which cannot be supplied by Germany to whom she has been showing preference.

New Bidding Rules Issued by U. S. Army

Walsh-Healey Law Clarified By Additional Clauses

Army bid invitations from now on will include several additional clauses intended to make clear some provisions of the Walsh-Healey Government Contracts Act and its supporting regulations issued by the Department of Labor. These will be based upon procurement circular No. 17, issued by the War Department on Oct. 1, it was said Oct. 14 at the quartermasters' depot at Philadelphia.

Original clauses embodied in army bid invitations since the act went into effect on Sept. 28.

Additional clauses comprise parts of Articles 101, 102, 103 and 501 of the Secretary of Labor's regulations, dealing with the following:

Article 101—In which the terms "manufacturer" and "regular dealer" are defined. Bidders now must state the category in which they qualify as legitimate bidders.

Article 102—Restricting regulations to only such employes as are actually engaged in the work under contract and excluding office and custodial employes.

Article 103—Dealing with over-time pay at time and a half the basic pay rate, which is mandatory for employes engaged upon government work in excess of eight hours in any one day or forty hours in any one week.

Article 501—Explains in detail the records of employment required of contractors and stressing that these data must be kept on file for at least a year after termination of the contract.

Copper Research Elects

The copper & Brass Research Association, 420 Lexington Ave., New York, has elected F. S. CHASE, president, Chase Brass & Copper Co., Inc., president. New vice-presidents are JOHN A. COE, president, American Brass Co.; C. D. DALLAS, president, Revere Copper & Brass Inc., and WYLIE BROWN, president, Phelps Dodge Copper Products Corp. C. D. PHILLIPS, president, Revere Copper & Brass, Inc., is treasurer and BERTRAM B. CADDLE is secretary.

Welding Society Elects A. E. Gibson President

Cleveland Annual Meeting Sees Award of Medal to H. M. Hobart

At the annual meeting of the American Welding Society, Oct. 19, at Cleveland, ALFRED E. GIBSON, vice-president, Wellman Engineering Co., Cleveland, was inducted as president of the organization, and E. R. FISH, Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn., became senior vice-president.

Divisional vice-presidents are:

JOHN H. ZIMMERMAN, Massachusetts Institute of Technology, Cambridge, Mass., New York and New England division; R. D. THOMAS, R. D. Thomas & Co., Philadelphia, and H. C. BOARDMAN, of the Chicago Bridge & Iron Works.

Directors are IRA T. HOOK, American Brass Co., Ansonia, Conn.; G. A. HUGHES, Truscon Steel Co., Youngstown, Ohio; R. E. KINKEAD, Cleveland; H. S. SMITH, Union Carbide Co., New York, and ANDREW VOGEL, General Electric Co., Schenectady, N. Y.

HENRY METCALF HOBART, consulting engineer, General Electric Co., was awarded the Samuel Wylie Miller Memorial Medal of the Society for the "significant research work" in welding he has done since 1917. He is chairman of the Fundamental Welding Research committee of the Engineering Foundation, which is directing over 60 welding researches in college laboratories.

Industrial Review

• WHILE there are wide variations in reports on early October business from various industrial centers, the concensus is that the month will show an impovement over September. Some distributors report the first fortnight of the month to be the best of the year, others tell of quiet business with high hopes for the last two weeks of the month. Labor troubles are apparently quiescent until after election.

• BOSTON opinions differ on the state of business during the first two weeks of October. The average seems to indicate an improvement on the September record. New York advices are to the effect that business volume is being well maintained. Prospects for the last quarter are good. There has been a slight letup both in inquiries and in orders in the Philadelphia territory but the recession is nothing to worry about. Pittsburgh expects no labor trouble until after election at least. Machine tool business has not been as good as it was in September but there are still a number of active quotations out.

• CLEVELAND reports a very strong tide of business in the first half of October and no labor difficulties of moment. Detroit is so busy with efforts to get the new models ready for the automobile show that there has been little time to think about shop equipment. There is every reason to believe that much more replacement business is to be placed. In Toledo business is not quite as active as it was but the general situation is decidedly optimistic. Cincinnati says that the volume of orders during the first part of October was not what had been expected although some business is being placed. Much the same situation prevails in St. Louis where most of the big buyers will not be in the market again until 1937.

• CHICAGO distributors expect October to be one of the best months of the year. There are no important labor difficulties. Milwaukee machinery firms are very busy and are expecting continued capacity operation for many weeks to come. Symbolizing potential industrial growth in southern Califorina is the celebration in Los Angeles of the arrival of power from Boulder Dam. Douglas Aircraft Co. reports unfilled orders on hand Oct. 7, $22,652,055, compared with $4,500,000 the same date last year. In San Francisco, Echlin Manufacturing Co. is beginning construction of a $500,000 automotive ignition parts plant. Coastwise, industry continues to show gains.

Willys-Overland New Financing Completed

Automobile Maufacturer Starts Free of Debt; $14,000,000 Assets

New working capital of $3,500,000 for Willys-Overland Motors, Inc., Toledo, was provided Oct. 16 when E. H. Rollins & Sons, Inc., representing underwriters of the securities of the motor car manufacturing organization, made final payment to George W. Ritter, its secretary and attorney.

The new company starts business with total assets in excess of $14,000,000, free from debt, except current taxes and workmen's compensation, and without bank loans.

Ward M. Canaday, chairman of the board, said: "The reorganized company enters business with 1,000 dealers and distributors and with advance orders for 50,000 cars already on hand. Initial employment schedules call for 5,000 men for the current production schedule of 60,000 cars."

Motors AND OTHER MATTERS

Car makers banking on big year . . . Manufacturing economies bring prices down . . . Small Ford engine has competitors worried . . . Steel bodies becoming universal . . . Smallest Packard eyes fleet business

BURNHAM FINNEY
Western Editor

DETROIT—If sales quotas can be taken as a criterion of the industry's hopes, car manufacturers are banking on a big year in 1937. General Motors expects to build nearly two million units. Chevrolet's bogey is 1,200,000 units; Buick and Oldsmobile each is aiming at 250,000. Pontiac hopes to pass the 200,000 mark. Even Cadillac-LaSalle is sharpening its sales knife for a larger slice of the market, and will offer LaSalle cars of longer wheelbase, more powerful motors and improved styling for around $1,000.

Chrysler Corp. expects to sell a million, with Plymouth assigned 600,000 and Dodge 235,000. Chrysler is shooting for 100,000 units, almost double its past year's volume. DeSoto, with a new plant and completely redesigned car, is committed to 65,000.

Henry Ford has not ventured any new public guess regarding V-eight sales, but executives at Dearborn indicate that they will be disappointed if the coming year's volume doesn't touch 1,200,000.

Quotas Are Conservative

Actually these quotas are relatively conservative. The total for the Big Three is about 4,100,000 units. If 10 per cent is added for the independents (and they didn't get 10 per cent the past year), the industry's output would be only 4,510,000 units, about that of 1936.

Ford is slowest in getting 1937 production started. Tooling is being rushed at Rouge, but machinery still is being delivered. It is probable that Ford may be largely responsible for pulling the industry's fourth quarter volume down below that of a year ago. Chevrolet and Oldsmobile also have got behind schedules.

The forthcoming appearance of the small Ford V-eight engine in the same chassis as the larger motor has competitors worried. Savings in building the bantam engine as against the bigger engine are reported to run from $10 to $20, with most of the economies occurring in the foundry. A competitive sales manager fears that a low-priced Ford would completely upset the used car market, particularly if the new car can be bought on the $25-a-month plan.

Those who have seen the new Willys-Overland say it is vastly improved in appearance. The management says it can break even by producing 30,000 cars. If it builds 70,000, which is the 1937 goal, its profit will be $1,600,000.

Factory retail prices thus far announced point to a narrowing of the range in the medium-price brackets. Lincoln-Zephyr is down $185 in base price. Zephyr lines incidentally are virtually unchanged from '36 models. La Salle is said to be changing to a V-type motor and will increase its wheelbase to 124 inches, at the same time reducing prices. Chrysler, substituting the name Royal for Airstream, will be priced closer to De Soto. Buick has reduced four-door sedans in its 40 series $40.

Plymouth has a one inch shorter wheelbase, but overall length is greater and weight has been increased about 100 lb. Chevrolet eliminates 145 lb. of weight, compared with the '36 job, yet it is longer and has better performance. It is reported that Chevrolet will continue two lines of cars with identical wheelbases and motors, but the Standard name will be changed for the lower-price line. The newly-designed valve-in-head engine has a displacement of 216 cu. in. and a four-bearing crankshaft with steel-backed babbitt-lined bearings. Chevrolet has expended $26,000,000 in retooling, of which $10,000,000 was at Flint, $8,000,000 at Detroit and $2,000,000 at Saginaw.

At the last minute Buick and Dodge advanced their announcement dates from October 24 to 17. Buick is offering 21 eight-cylinder models, compared with 15 last year, in four series with the horsepower stepped up somewhat. All-steel bodies on the 40 and 60 series have tapered streamlined tails and are new. The 80 and 90 series have wood-and-steel bodies of the same design as in 1936. Buick's steel bodies, a radical departure from past practice for Fisher, have only three points where wood is used, and then not for structural purposes.

Insulation Is Problem

Special attention has been given to insulating bodies so that in shutting doors one hears the same solid sound as with wood-and-steel construction. Front fenders are stamped in one piece, being mounted as a unit with the front-end sheet metal assembly. The radiator grille is die cast in two parts, with horizontal bars rising to the hood line. Running boards are separate from the body or fenders, and serve as radio antennae.

Hypoid gears are of Buick's own design, which, it is claimed, adds to the life of the axle compared with other hypoid gears when conventional lubricants are used. What is known as an "aerobat" carburetor is said to give much superior performance to previous types and is equipped with an automatic deflooding mechanism. Buick expects to make 70,000 cars in the fourth quarter.

Larger Bodies This Year

Dodge has larger bodies, with wider seats and lower floor providing more headroom, and is available in 10 body styles. It has an all-steel top which consists of one huge stamping from front cowl to rear luggage compartment. Bodies are insulated from the chassis by "chassis outriggers" equipped with rubber spools through which chassis and body are prevented from being in metal-to-metal contact.

Graham-Paige has substituted a welded steel insert in the top for the former fabric top. Hudson hopes to ship 10,000 cars this month, and Packard has a backlog of over 13,000. cars. Packard is trying to break into the fleet business with its six. The idea is that a company will gain prestige by having its salesmen make their calls in a Packard

Despite all the recent talk about individuality in car design for '37, most of the cars bear a general resemblance to each other.

Factories Absorb 166,000 in August

Gain for Month Represents Nearly $7,300,000 in Payrolls

A general gain in factory employment, plus a small net increase in non-manufacturing industries, sent 166,000 persons back to private employment in August and increased weekly payrolls in the industries studied by about $7,300,000, Secretary Perkins of the Department of Labor announced last week.

Seventy-one of 90 manufacturing industries studied the Bureau of Labor Statistics reported gains in employment and payrolls, and the gains in ten of sixteen non-factory industries offset by about 1,000 jobs the losses in the other six.

The increase of about 2.2 per cent in factory employment from July brought the bureau's index to 88.7, the highest level since September, 1930. The 4.1 per cent increase in payroll totals brought that index to 81.0, the highest since October, 1930.

While a large proportion of the durable goods industries showed gains in employment, the level of employment for the durable goods group as a whole remained unchanged, due largely to the sharp seasonal decline in employment in the automobile industry.

The August employment index for the durable goods group (79.7) is, with the exception of the two immediately preceding months, higher than in any preceding month since September, 1930, and indicates that 797 of every 1,000 workers employed during the index-base period were employed in August, 1936.

New Securities Mark Modernization Trend

Bulk of Fresh Capital Will Go For Plant and Equipment

An emphatic trend by issuers to obtain, through the sale of securities, new money for plant equipment and improvement and to increase working capital, was indicated last week by an analysis of registration statements filed under the Securities Act of 1933, a summary prepared by the Securities and Exchange Commission and covered statements effective in August, shows.

In August statements covering issues with estimated gross proceeds of $286,022,000 were effective, compared with $362,925,000 in July, and of which $118,033,056, or 58.6 per cent of the net proceeds from cash sales represented new money, the largest monthly amount in this category since the registration provisions of the Securities Act became operative in July 1933.

The August total, too, lifted the net amount sought by issuers for the first eight months of 1936 to $395,600,000, compared with $100,100,000 correspondingly in 1935 and $160,500,000 for the whole of last year.

This table indicates the trend of the "new money" financing:

	12 Months 1935 (millions)	8 Months 1935 (millions)	8 Months 1936 (millions)
Real estate, plant equipment and miscellaneous	$49.	$29.	$112.
Working capital	106.	69.	277.
Organization and Development	5.	2.	6.
Total	$160.	$100.	$395.

TON OF MACHINERY SHIPPED BY PLANE

One ton of electric generator machinery, shipped from Pittsburgh in a "flying box car," is being installed in a South Chicago steel plant, crippled by an equipment breakdown. The interior fittings of the plane were removed to make room for the heavy load.

MEETINGS

AMERICAN GAS ASSOCIATION. Eighteenth Annual Convention, Oct. 26-30, Atlantic City, N. J., Maj. Alexander Forward, managing director, 420 Lexington Ave., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual Meeting, Nov. 30-Dec. 4, Engineering Societies Bldg., New York. C. E. Davies, secretary, 29 West 39th St., New York.

AUTOMOBILE SHOW, NATIONAL. Nov. 11-18. Grand Central Palace, New York. Alfred Reeves, general manager, 366 Madison Ave., New York.

INTERNATIONAL ACETYLENE ASSOCIATION, 37th Annual Convention, Nov. 18-20, St. Louis.

MARINE EXHIBITION, Third Annual. Nov. 12-20, Maritime Bldg., New York. A. R. Risso, chairman, 80 Broad St., New York.

TWELFTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Nov. 30—Dec. 5, Grand Central Palace, New York, Charles F. Roth, manager.

Half-Million Paid In Employe Benefits

Brown & Sharpe Relief Association Marks Fiftieth Anniversary

The Brown & Sharpe Mutual Relief Association observed the 50th anniversary of its founding Sept. 10 with a report that during this half-century it has paid to members $455,117 in sick benefits and over the past 27 years $63,600 in death benefits.

About 82 per cent of the company's employes are members. They elect their own officers and manage the association's business. Overhead expense is donated by the company, which also gives an annual donation equal to a percentage of total benefits paid to members.

Over the 50-year period of the association's existence, there have been but four presidents—Alpheus L. Greene, who served more than 15 years; Mitchell Dawes, who served the next 10 years; Walter Wright, who served 8 years, and David Arnott, present head of the organization, who now has served more than 16 years. Thirty men comprise the directorate.

OBITUARIES

C. E. BROOME, field sales manager and engineer of Ajax Flexible Coupling Co., Westfield, N. Y., died Sept. 27 in Cleveland.

SHIRLEY S. FRENCH, 55, formerly general manager, Berger Mfg. Co., Canton, Ohio, died Sept. 18.

DAVID MCWHIR, 53, chief inspector, Pratt & Whitney Aircraft, died recently.

DR. SAMUEL MONTGOMERY KINTNER, 65, vice-president in charge of engineering, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., died Sept. 28.

HENRY ELLSWORTH MORTON, 73, president, Morton Mfg. Co., Muskegon Heights, Mich., machinery manufacturer, died Sept. 29. He had spent 58 years building up the company, and was a leading industrialist in the metal-working field.

FRED A. ROSS, for nearly half a century superintendent of Luther Mfg. Co., Olean, N. Y., machinery and tool manufacturer, died recently.

A. W. WYCKOFF, 63, president of Wyckoff Drawn Steel Co., Pittsburgh, died Sept. 25. He was widely known for the past 35 years as a progressive industrialist. He organized the Wyckoff Company in 1919.

Studebaker Vice-President

ROY E. COLE

PERSONALS

E. C. BULLARD, vice-president and general manager, The Bullard Co., Bridgeport, Conn., sailed Oct. 1 on an extended business trip to Sweden, Russia, Germany, France and England.

ROBERT G. CALTON, vice-president, Tennessee Enamel Mfg. Co., Nashville, was elected president of the Porcelain Enamel Institute, Oct. 1 and 2, Cleveland. Other officers reelected were: EMERY R. LASIER, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., and FRANK E. HODEK, JR., General Porcelain Enameling & Mfg. Co., Chicago, vice-presidents; WILLIAM HOGENSEN, Chicago Vitreous Enamel Product Co., Cicero, Ill., treasurer, and GEORGE P. MACKNIGHT, 612 North Michigan Ave., Chicago, secretary. Executive committee members were also reelected.

R. R. COOKE has been put in charge of the new manufacturing plant of Cutler-Hammer, Inc., 970 Folsom St., San Francisco. He has had 30 years' experience in manufacturing electric control equipment.

WILLIAM E. CROCOMBE has been elected vice-president of the American Brake Shoe & Foundry Co., Chicago. He has had wide experience as a production executive in the steel and forgings fields.

LESTER M. CURTISS has been appointed assistant general superintendent of Lukens Steel Co., Coatesville, Pa. In 1928 he became superintendent of the company's 140 in. and the 206 in. plate mills, the latter being the largest in the world, and later became superintendent of production.

ROY E. COLE has been elected vice-president in charge of engineering, Studebaker Corp., South Bend, Ind., succeeding D. G. Roos, recently resigned. In 1924 he was appointed chief engineer of Dodge Bros., and in 1931 became head of Rockne Motors, Studebaker unit, engineering department. He joined Studebaker in 1933.

W. S. JAMES, succeeds Mr. Cole as chief engineer. Since 1926 he has been in charge of the company's research engineering department, and formerly was a research scientist, National Bureau of Standards, Washington, D. C.

CHARLES HAYDEN, financier, has been elected chairman and president of Mack Trucks, Inc., succeeding the late A. J. BROSSEAU.

GUST HEIDRICH has been appointed factory manager of Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit.

R. A. LABARRE, for many years known in the automotive field as a designer and builder of bodies, has joined Covered Wagon Co., Mt. Clemens, Mich., as chief engineer of the tourist trailer manufacturing concern.

WALTER N. LARKE has been appointed superintendent of the engine division of the Buick Motor Co., Flint, Mich. For the last two years he has been assistant superintendent. He will be succeeded by FRED W. LETTS, who recently has been general foreman of the crankshaft department.

FREDERIC E. LYFORD, one time assistant general machine foreman,

Named Superintendent

E. JOHNS

E. JOHNS has been appointed superintendent of the Newark, N. J., plant of National Bearing Metals Co., St. Louis.

Studebaker Chief Engineer

W. S. JAMES

Sayre shops, Lehigh Valley Railroad, and special engineering assistant to the vice-president, has been appointed assistant to ROBERT S. BINKERD, vice-president of Baldwin Locomotive Works. He was recently examiner for the R.F.C.

E. H. MCCARTY, president of Nash Motors Co., Kenosha, Wis., has resigned, C. W. NASH, chairman, announced. Mr. McCarty's plans have not been announced.

M. V. MILTON, chief boiler inspector, Canadian National Railway, was elected president of the Master Boiler Makers' Association, Sept. 17, at Chicago. ALBERT F. STIGLMEIER, general foreman boiler maker, New York Central Railroad, West Albany shops, was chosen secretary-treasurer.

JAMES Y. SCOTT, formerly vice-president of Van Norman Machine Tool Co., Springfield, Mass., has been appointed treasurer and general manager and is now executive vice-president. LEO F. HUNDERUP has been promoted to assistant general manager, and R. W. PORTER becomes assistant treasurer, succeeding Mr. Scott, CHARLES E. VAN NORMAN announced.

W. C. STRAUB, New York branch manager, Chicago Pneumatic Tool Co., is now assistant to the executive vice-president.

T. H. WICKENDEN, assistant manager, development and research, International Nickel Co., New York, is chairman of the American Society of Mechanical Engineers committee in charge of the symposium on Corrosion Resistant Metals, which will be held during the Society's annual meeting, Nov. 30 to Dec. 4, in New York.

BUSINESS ITEMS

Bullard Co., Bridgeport, Conn., has appointed Valentine Hart assistant sales manager. He has been on the company's sales force for a number of years.

Cutler-Hammer, Inc., Milwaukee, Wis., electric control apparatus manufacturers, has begun operations in its new factory at 970 Folsom St., San Francisco. Its other plants are in New York and Milwaukee.

Fellows Gear Shaper Co., Springfield, Vt., has appointed W. P. Lotz assistant sales manager with offices in the Fisher Bldg., Detroit. He was formerly manager of the New York office of Kearney & Trecker Corp.

Globe-Union, Inc., Milwaukee, is the new name of the Globe-Union Mfg. Co., makers of metal specialties and automotive parts. The company operates plants in Atlanta, Cincinnati, Dallas, Los Angeles, Memphis, Philadelphia and Seattle, besides Milwaukee.

Hammond Machinery Builders, Inc., Kalamazoo, Mich., has established an office at 148 West 23rd St., New York, with W. J. Holtzmeier as Eastern manager. The company builds grinders and polishing and buffing lathes.

Ingersoll Milling Machine Co., Rockford, Ill., has named Frank Burgan representative covering the north eastern section of Ohio, succeeding Henry P. Boggis & Co., Cleveland. He is also representative of the small tool division of the company.

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, has opened a New England office in the Chamber of Commerce Bldg., Boston, staffed for consulting service for instrumentation in manufacturing processes. The company's complete line of measuring recording and controlling instruments and electric heat-treating furnaces will be handled through the new office.

Leland-Gifford Co., Worcester, Mass., has appointed Al P. Witteman, formerly with Nash Motors and more recently with Falk Co., Milwaukee, manager of its Cleveland office.

Linde Air Products Co. has opened a district office at 2 Virginia St., Charleston, W. Va., with A. R. O'Neil in charge. This is the thirty-first branch to be established by the company, a unit of Union Carbide & Carbon Corp. The company manufactures oxygen, acetylene and calcium carbide in Charleston.

National Separator & Machine Co., is now known as National Separator Co., a subsidiary of Leon J. Barrett Co., Grafton St., Worcester, Mass.

New York Belting & Packing Co., Inc., Passaic, N. J., has appointed Laid Co., 754 South First St., Louisville, Ky., distributors in that area.

Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, has appointed George F. Duncan, formerly with General Electric Co., assistant motor sales manager.

Nichol Machinery Co., 711 West Michigan St., Milwaukee, is the name of the former W. G. Nichol Co.

Producto Machine Co., Bridgeport, Conn., milling machine manufacturer, has appointed Perry W. Rice sales representative in the Cleveland district. For many years he has been connected with the Chicago office of Hendey Machine Co., Torrington.

William K. Stamets, Pittsburgh, has appointed A. A. Jamieson its representative in the Ohio territory, as a member of the Pittsburgh staff. He was formerly with Westinghouse Electric & Mfg. Co., and more recently with Carboloy Co., Detroit.

Universal-Cyclops Steel Corp. is the named of the merged Universal Steel Co., and Cyclops Steel Co. The Universal plant at Bridgeville, Pa., and the Cyclops plant at Titusville, Pa., will continue in operation. Headquarters of the concern will be at Titusville, Pa.

Warner & Swasey Co., Cleveland, has appointed Walter L. Loegler manager of the company's Chicago office, following nine years in the Dayton, Ohio, territory. He joined the company in 1912 as an apprentice, and seven years later was transferred to the Boston sales staff. He succeeds G. Kochenderfer, recently resigned. Albert Schnaitman succeeds Mr. Loegler.

Exports of Machinery During August, 1936

	August 1936	July 1936	August 1935
Electrical machinery and apparatus	$7,207,420	$8,042,542	$6,548,059
Power generating machinery (except automotive and electric)	639,578	1,089,668	654,128
Construction and conveying machinery	1,024,222	1,185,424	737,396
Mining, well and pumping machinery	2,477,771	3,091,118	2,410,654
Power-driven, metal-working machinery	2,234,789	2,885,815	2,053,853
Other metal-working machinery	205,425	267,553	192,417
Textile machinery	884,212	1,267,961	646,524

Exports of Metal-Working Machinery During August, 1936

Engine lathes	$145,790	$105,843	$77,816
Turret lathes	215,054	116,519	29,653
Other lathes	61,274	79,224	93,107
Vertical boring mills and chucking machines	63,836	74,178	133,534
Thread cutting and automatic screw machines	159,570	61,961	59,423
Knee and column type milling machines	72,882	129,810	52,778
Other milling machines	210,254	184,355	193,649
Gear cutting machines	77,510	154,541	77,424
Vertical drilling machines	6,119	76,824	25,044
Radial drilling machines	7,752	21,828	24,887
Other drilling machines	55,541	163,547	47,815
Planers and shapers	40,405	44,028	51,128
Surface grinding machines	112,050	57,587	52,432
External cylindrical grinding machines	32,895	74,330	47,631
Internal grinding machines	69,183	37,632	84,489
Tool grinding, cutter grinding and universal grinding machines	59,161	167,499	59,027
Other metal grinding machines	55,566	67,882	28,588
Sheet and plate metal working machines	116,329	328,959	202,127
Forging machinery	68,758	173,393	135,821
Rolling mill machinery	185,828	215,109	317,578
Foundry and molding equipment	57,276	79,558	61,663
Other power-driven metal-working machinery and parts	361,756	471,208	198,239

Other Metal-Working Machinery

Pneumatic portable tools	$55,198	$75,298	$66,220
Other portable and hand and foot operated metal working machines and parts	76,448	79,778	59,792
Chucks for machine tools	12,129	13,190	10,395
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	29,390	68,313	27,615
Other metal-working machine tools	32,260	39,974	28,195

GOLD MILLS SHOW GAIN

Canadians Buying U. S. Machinery As Industry Grows

Canada now has 121 gold milling plants in operation, and mining authorities expect that before the end of the year there will be 145 plants turning out gold bullion.

Much of the machinery purchased and contracted for is from the United States.

The number of mills now operating is four times the number operation in 1931, when 30 plants were reported, and there are today ten more under construction, with at least eleven more proposed on promising properties.

American Machinist — REFERENCE BOOK SHEET ©

Bend Radii for Steel Tubing

Courtesy of the Formed Steel Tube Institute

Incorrect design of bent tubular parts makes it difficult for the shop to execute orders without excessive expense and much trouble. In making a bend the outside metal of the tube is stretched and the inside is compressed. Buckles tend to form at the inside of the bend. Consequently, for light gages a mandrel must be used to keep the metal smooth. There are limits to bends that can be made, depending upon the size, the gage and the temper of the metal. Very small radius bends are uneconomical in large diameter tubing of light gage because of the scrap loss and slowness of operation. Money can be saved if a heavier wall, a smaller tube, or a larger radius is selected. As a guide, tables of minimum radii for various diameters and gages of tubing are given. The radius is taken on the centerline of the tube and not to the inside or outside of the bend.

Mandrel Bends

There are two types of bends; first, the mandrel bend, and second, a bend made without a mandrel. The equipment used for making a mandrel bend consists of a machine to which is attached a bending die and mandrel holder, and the necessary jaws and clamps to grip the tube while being bent. The tube is pushed over the mandrel, or the mandrel is inserted into the tube mechanically. The better grade of bends is made by this process, but as the tools are expensive and the operations slow, their cost is somewhat high. Mandrel bends must be used only when the metal must be kept smooth. The reduction in diameter in the vertical plane is very slight, and the bend is free from wrinkles. In the light gages and for small radii, it is difficult to make bends of this type that are wholly free from wrinkle "shadows" so the radii of Table I should be used whenever possible.

Table I—Minimum Radii for Mandrel Bends

O.D.	B.W. Gage	Minimum Radius, In.
½ to ⅞	16	1½ x O.D.
½ to ⅞	18	2 x O.D.
½ to ⅞	20	2½ x O.D.
1 to 2¼	14	1½ x O.D.
1 to 2¼	16	2 x O.D.
1 to 2¼	18	2½ x O.D.
1 to 2¼	20	3 x O.D.
2½ to 3¼	14	2 x O.D.
2½ to 3¼	16	2½ x O.D.
2½ to 3¼	18	3 x O.D.
2½	20	3½ x O.D.
3½ to 4	14	3½ x O.D.
3½ to 4	16	4 x O.D.
3½	18	4½ x O.D.

Reduction in diameter of the vertical plane 120 per cent of the gage—maximum.

Distance Between Bends

Bends in same plane 1½ x O.D.
Bends in different plane 2½ x O.D.

Distance between bends is defined as that distance between center point of radii plus the sum of the radii.

Distance of bends from end of tube:

In order to maintain true diameter of tube at the end, the center point of the bend must be located twice the diameter from the end plus the radius.

Sized Ends:

Ends can be sized when tolerances are closer than the tolerance for flash in grade of straight tube involved.

Tools

Tools are considered standard by tube manufacturers when they comply with the following qualifications:

1. When the above specifications for a standard part are met.
2. From minimum radius up to 8 in. radius in ¼ in. increments.
3. From a 9 in. radius to 12 in. radius in ½ in. increments.
4. From a 12 in. radius to a 20 in. radius in 1 in. increments.
5. A 20 in. radius is maximum.
6. When tube used, i.e., diameter and gage, is standard as established under straight tubing for flash in grade.

Bending Without a Mandrel

There are numerous methods of making a bend without a mandrel, but the results are similar. The tools required are inexpensive, can be used over a wide range of angles and the operation is rapid. In making a bend without a mandrel the dies must be somewhat smaller than the tube in order to support the metal, and to keep it from wrinkling. There is a reduction in

Table II—Minimum Radii for Bends Without Mandrel

Diameter In.	B.W. Gage	Minimum Radius, In.
¾	14	2.0682
	16	2.1244
	20	2.2175
1	14	2.8436
	16	2.8998
	18	2.9495
	20	2.9928
1½	14	4.3942
	16	4.4505
	18	4.5002
	20	4.5435
2	14	5.9449
	16	6.0012
	18	6.0509
	20	6.0942
2½	14	7.4956
	16	7.5519
	18	7.6016
	20	7.6449
3	14	9.0463
	16	9.1026
	18	9.1523
	20	9.1956

Reduction in diameter of the vertical plane, 12½ per cent of the O.D.

Distance Between Bends

Bends in same plane 1 x O.D.
Bends in different plane 3 x O.D.

Other data on distance between bends and on tools are the same as for Table I.

Bend Radii for Steel Tubing

diameter in the vertical plane, but the tube is free from wrinkles.

Although it may be possible to produce bends of smaller radii than tabulated in Table II, and with radii closer together and other features, the bends become more costly to produce.

The minimum radius will be determined by the following formula:

$$L = \frac{0.2468\,\pi\,(D^2 - d^2)}{g}$$

Where:

L = Centerline radius
D = Outside diameter
d = Inside diameter
g = Gage

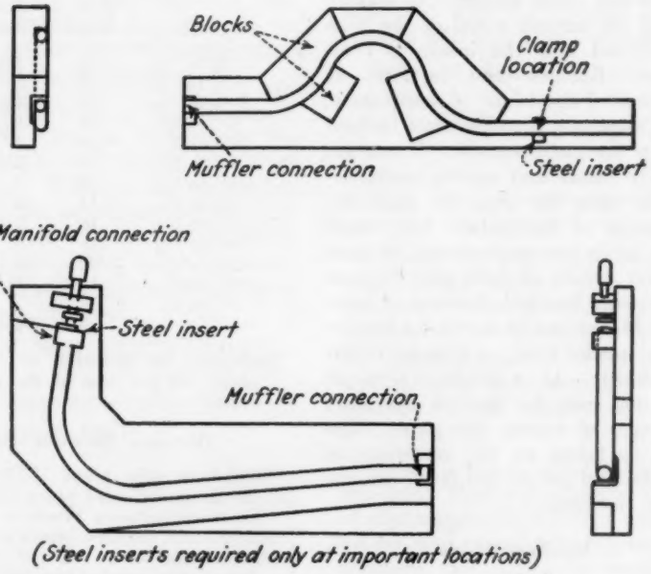
Checking Formed Tubes

Because of the peculiar shapes of bent tubes, they are at times very difficult to check. The following method will avoid confusion whether the work is done in the shop or outside. A drawing should be made showing the dimensions and type of gage to be used for checking the bent parts. This drawing should indicate the gaging points and the tolerance on the clearance that will be allowed. If the end of the tube is flanged, the drawing should show the fixture for checking the position of the flange, and if clamps are used to draw the flange up to a fixed block, the type of clamp and fixture required should be illustrated.

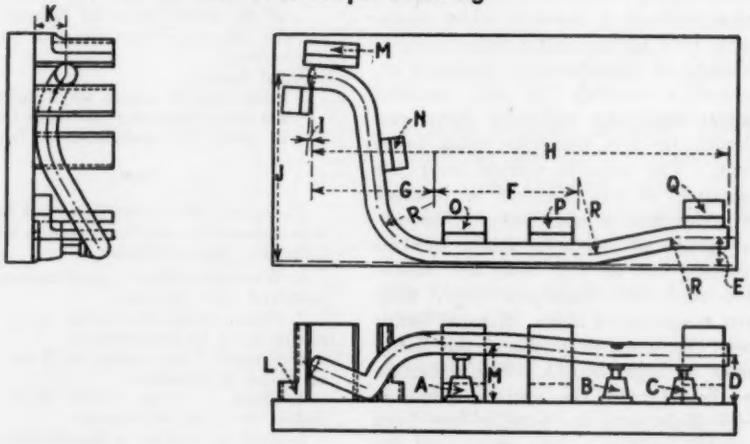
Various types of templets or gages are being used for checking formed tubes, but the type shown will answer almost all requirements. In checking bent tubes by means of a paper drawing or templet, a surface plate and rectangular steel block are used to line up the tube. Planer jacks or adjustable blocks can be used to support the tube in various planes so that accurate measurements can be taken. If one end of the tube is flanged, it should be clamped to a steel block of sufficient length to give an accurate location on the paper templet.

CHECKING BENT TUBE

1 – By Wooden or Metal Gage



2 – From Paper Drawing



"Why, if I took home double pay tomorrow she'd make a dash down to the Emporium in 10 flat"

IF THE WORKER ONLY KNEW—

Wouldn't he see that wages must depend on production?

IT SURE gets my goat, Bill. I don't think that guy knows what he's talking about."

Big Bill and Sam, planer hands, were walking home from a lecture at the foreman's meeting to which they had been invited.

Sam went on: "First he tells us that good times depend on purchases of industrial and farm products. Then he says the ordinary people like us buy much more than the rich. And then he says if wages went up in a big jump purchasing would go down. I don't get it. To a brain-truster like you I suppose it's easy."

"Don't call me a brain-truster, just because I do some reading and studying. It's not easy, Sam, but I think I do see the light. Maybe I can help make things clear. Now the first thing—you agree that if the goods industry turns out aren't bought, there's no use making them, don't you?"

"Yeh, that's right."

"And the same thing is true of farm products?"

"Yeh."

"All right. And you admit that there are many more ordinary people like us than rich people?"

"Yes, that's right, too."

"So that means even though a rich man may have up to a half dozen automobiles, most of the cars have to be bought by us ordinary fellows, because there are so many more of us?"

"I admit it, Bill, and I see the same is true of other things that are made, and the stuff grown on the farms, too."

"Looks like we agree with the speaker on his first two statements, then, Sam. And that brings us up to wages, and what he said would happen if they went up in a big jump."

"And that's where I don't understand him, Bill. I know *I* could buy lots more if *I* got twice as much money—that is, the Mrs. could. Why, if I took home double pay tomorrow she'd make a dash down to the Emporium in ten flat."

"You bet she would, Sam. And a good idea, because if everybody else got double money, too, prices would go up so fast she wouldn't be able to run fast enough to keep up with them."

"What do you mean? Labor is only a small part of the cost of making anything."

"Oh, yes? Think back on that one, Sam. For example, all we have to start with in making the machines we turn out at the plant is iron ore, you know. Now take all the factories, making all kinds of things. Do you know that from 60 to 67 cents of every dollar taken in by factories goes to wages? And about another 18 cents to salaries? That's a total of around 80 cents. And believe me, if you doubled that, prices would have to go up."

"But wages could go up without being doubled, Bill. Suppose they went up only 25 per cent."

"Well, I happen to know, Sam, that at present prices that would take 84 cents out of every dollar industry gets. There wouldn't be enough left to pay salaries. There would be nothing for dividends and nothing could be saved to buy new machinery and to pay for things when bad times come again."

"Shouldn't we ever have a raise, then?"

"Sure we should. In fact, when things are going right, we're getting raises all the time. I mean that the things we buy are coming down in price. We buy more of them, and that's the same as getting a raise."

"But I like to feel it in my pocket, Bill. I want to *know* I'm getting it."

"And don't you, Sam? Don't you remember that you couldn't afford an automobile fifteen years ago, because it would have cost you just about twice what it does now? And don't you remember you looked at the little old tires in the windows and wondered how you'd ever get $100 together for a set of four, if you did own a car? You remember you couldn't pay $140 or so for a washing machine for your wife? And do you remember that you didn't even know about radio, and that now you have two?"

"But if I had a raise—"

"*You* may get one, Sam—I don't know. I'm not saying everybody's getting all he ought to have. I'm only trying to show you that what that fellow said was right. You can't get blood out of a turnip, you know. And you can't hand around automobiles and washing machines and radios until they have been made. And you have to make 'em at low cost. And sell 'em at low prices—"

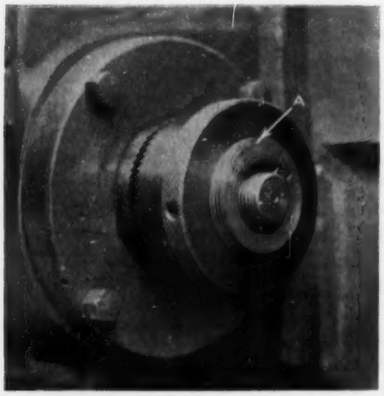
"Okay, Bill. I suppose that guy must have been right, since you agree with him. So long. See you tomorrow."

Ideas FROM PRACTICAL MEN

Micrometer Feature for the Gear Generator

O. S. MARSHALL

In using the Gould & Eberhardt gear generator for cutting helical gears in two cuts, roughing and finishing, before taking the finishing cut three adjustments must be made to have the cutter track correctly in the work; one for the vertical slide; one for the angular position of the work table; and one for the cutter spindle. Index lines are provided on the machine for each of these adjustments. In making them, the clutch for the table drive is disengaged and the cutter spindle is revolved by means of the crank on the drive shaft where the speed change gears are located. Disengaging the clutch permits the adjustment to be made without rotation of the work table.



With the outer member of the clutch mounted on a threaded sleeve, full engagement of the clutch teeth can be made without rotating the work table and disturbing its adjustment

The teeth in the clutch are not fine enough to permit full engagement without at the same time slightly revolving the work table or the cutter spindle, disturbing their adjustments. While rotation of either of these parts to engage the clutch may give close enough adjustment for gears of 14 D.P. and coarser, provided enough stock has been left by the roughing cut, it is not close enough for gears of 16 pitch and finer.

To overcome the difficulty, we made a new clutch having finer teeth than those in the original one and mounted the outer member on the threaded sleeve *A*, as shown in the illustration. This sleeve has a keyway and slides axially on a feather key in the shaft. It is 2⅛ in. in diameter and has 12-pitch, right-hand double threads.

When the index lines on the work table and the cutter spindle coincide with the marks on the machine, the clutch teeth can be fully engaged without even slight rotation of the work table by sliding the outer clutch member and the threaded sleeve inward until both clutch members are in contact. It then is necessary only to set up the clamping nut securely (the nut was removed for clearness before the photograph was taken), when the pressure exerted by tightening the nut will cause the ratchet teeth on the outer member to automatically roll into engagement with those of its mating member. The threaded sleeve projects beyond the outer clutch member so that the clamping nut will bear against it without contacting the clutch member. Once the nut is set up firmly, no slippage will occur.

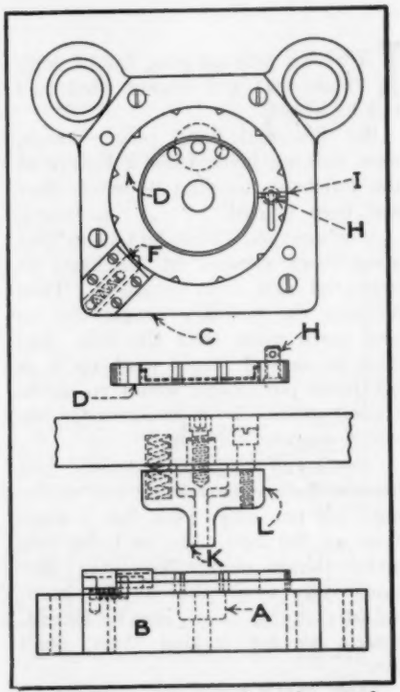
Indexing Die for Piercing

WILLIAM C. BETZ
Equipment Engineer, Fafnir Bearing Company

When quantities do not warrant making tools for piercing holes in a circle all at one time, the indexing die illustrated may be used for piercing the holes separately.

The die member consists of the hardened die bushing *A* pressed into the base *B* of a standard die set; the square base piece *C;* the index ring *D;* the index pin *F;* and the cam *H*. The index ring, which is also the work holder, is spring tempered and is split on one side at *I*. After being heat-treated, it is ground on both sides. Then a shim 0.003 in. thicker than the width of the slot is inserted and the bore of the ring is ground accurately to the outer diameter of the work, the outside being ground 0.003 in. smaller in diameter than that of the bore in the base piece. When the shim is removed from the slot, the natural spring of the ring closes it enough to grip the work sufficiently for indexing.

To load the work in the index ring, the ring is removed from the base plate and is spread by the cam. After inserting the work, the cam is rotated to its former position, permitting the ring to close on the work. The ring is then put back into the bore of the base piece. To unload the work from the index ring, the ring is removed from the base piece and is spread by rotating the cam, permitting the work to be removed. In loading and unloading the work, it is necessary to remove the index ring because it could not be expanded sufficiently while in place without making it unduly loose in the base piece, which would destroy the accuracy of indexing. Indexing is, of course, done by hand, notches in the periphery of the



The index ring is also the work holder. It is slit on one side and is expanded by a cam to permit loading and unloading the work

index ring being provided for engagement of the index pin.

The punch *K* is attached to the punch plate in the usual manner and is fitted with the spring shedder *L*. If a central hole were required in the work, the shedder could be made to accommodate both punches. Block indexing to pierce two or more holes at the same time can be done by providing a proper die bushing and the requisite number of punches.

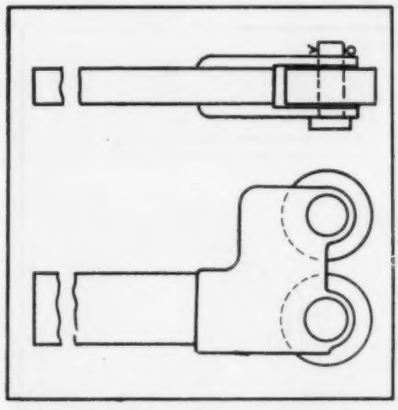
Straightening Work in the Lathe

EDWIN KILBURN

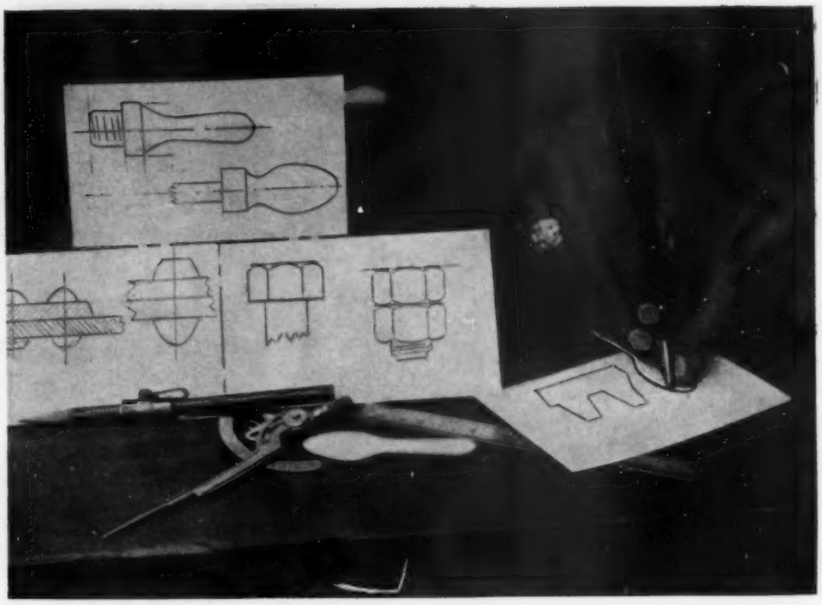
Our usual practice in straightening round work is to mount it on centers in the lathe, or if that is not convenient, to hold one end in the chuck and the opposite end on the tailstock center. With the lathe running slowly, an oxyacetylene torch is used to heat the work at the bend, care being taken not to bring the torch close enough to fuse the surface.

When the work has reached a dull red color, the roller tool illustrated, which has previously been located opposite the point of maximum bend, is brought against the work while it is revolving, sufficient pressure being applied to iron out the bend. As the work cools, the pressure is gradually reduced until the rollers barely touch it. The shank of the tool is set parallel with the cross-slide and at a height that will bring both rollers to bear equally on work that runs true.

We have found that work can be rapidly straightened by this method, and have also found that light work can be straightened without heating.



The work is heated by an oxyacetylene torch while slowly revolving, and the roller tool is brought against it at the point of maximum bend with sufficient pressure to iron out the bend



For making rough drawings the wooden spoon is a cheap and helpful addition to the vest pocket

Sketches from Spoons

FRANK BENTLEY

Next to the problem of what to do with used razor blades is what to do with wooden ice cream spoons when the ice cream is gone. For a shop man, away from the shop, who wants to make drawings, the answer is easy.

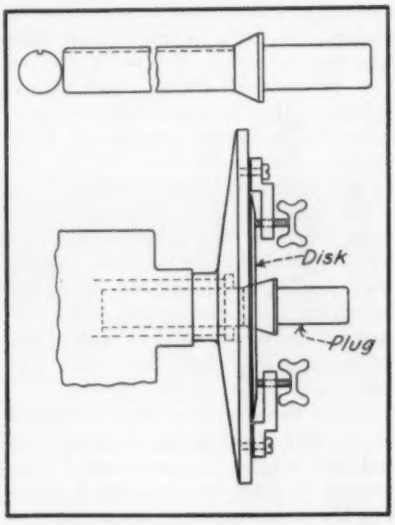
The ice cream spoon makes a fine irregular curve and forms a good substitute for the celluloid variety when regular drawing implements are not available. Such are its contours that many common things—rivets, bolts, nuts, handles, gear teeth and such—can be quickly outlined. The spoons are easy to obtain, and with a scale and rough pencil compass, make a useful impromptu drafting set.

Disks Centralized With a Taper Plug

H. J. CHAMBERLAND

One order in a job shop involved 100 slitting disks measuring $7 \times \frac{3}{16} \times 1\frac{1}{4}$-in. bore. These disks had a bevel edge which was to be ground concentric with the bore. Because of the thin edge a three-jaw chuck was out of the question for centering the bore for grinding, to give a locating means for subsequent grinding of the bevel.

In the set-up illustrated, a locating plug was turned and ground to fit the bore of the spring collet adapter. The faceplate was tapped for the two straps which in turn were fitted with wing screws. Only 10 sec. were required to center the disk, bolt it in place and remove the plug.



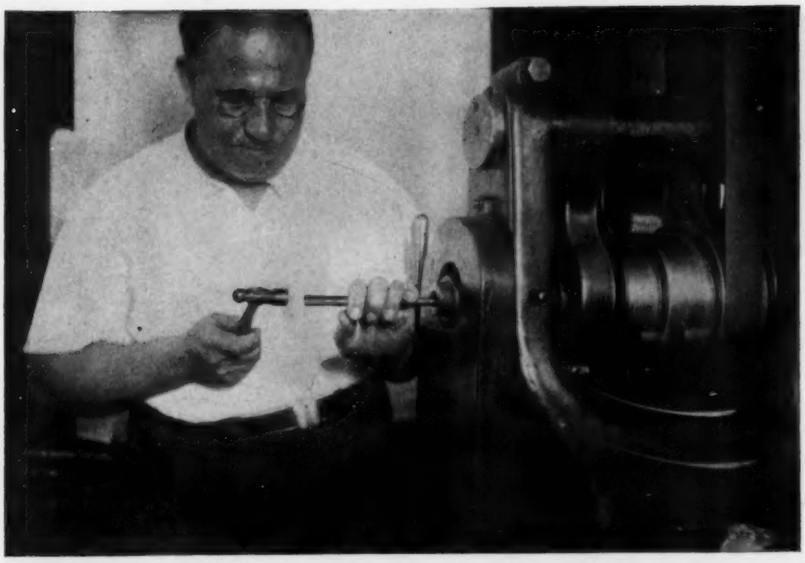
After the bore is located by the taper plug it is ground in the lathe

Kinks Did It—Why?

GEORGE J. MURDOCK

A milling machine arbor, handled by a man having naturally acid perspiration and allowed to remain in the spindle for a long time, became stuck. All efforts to drive it out with a piece of cold-rolled shafting inserted in the spindle and used as a battering ram were futile.

One of the workmen asked to be



A kinked bar can be used to drive out a stuck arbor

allowed to try his method. He took a piece of ⅝-in. hexagon brass rod and bent several short kinks in it near one end and inserted it into the spindle, kinked end first. Then with a light hammer he struck the outer end of the brass rod sharply, holding it lightly so that it bounced in his hand. After about twenty minutes of hammering, the arbor shot out of the spindle and landed on the floor.

On examination, rusty finger prints were found on the arbor shank and, by using a flashlight, the taper hole in the spindle was found to be rusted in spots that corresponded to the rusty finger prints on the shank of the arbor, showing that the arbor had been rusted fast in the spindle.

Many theories have been advanced as to why striking the kinked brass rod with a light hammer exerted force enough to drive out the rusted arbor, but the only reason seems to be connected in some way with the kinks in the brass rod, and it has been thought that the kinks striking the wall of the spindle bore had something to do with it. Nevertheless, the kinked rod did the work and without injury to the spindle.

Bar for Testing Alignment of Lathe Centers

F. MUIR
Hamilton, Ontario, Canada

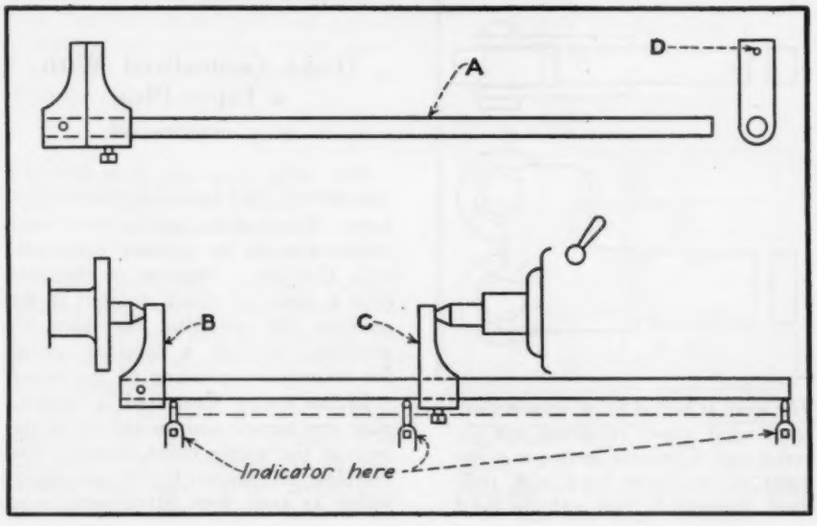
To test the alignment of lathe centers, the tailstock should be in the same position it will be when the work is being turned. The reason is because the centers will hardly ever be in alignment when the tailstock is in different positions on the lathe bed, except in a new lathe. However, to test the alignment of the centers would require the use of bars of different lengths, one for each length of work to be turned and, if the distance between centers is very short, the amount they are out of alignment may be hard to measure.

The adjustable bar illustrated not only takes the place of numerous bars of different lengths, but permits the test to be made along the whole length of the bar.

The device consists of the flat, ground bar *A* and the two arms *B* and *C*. Arm *B* is pinned tightly to the bar, while arm *C* is a sliding fit thereon and is provided with a setscrew to tighten it in any position. Both arms are drilled and countersunk at *D* for the centers.

To use the bar, lay it on a flat plate and adjust and tighten arm *C* to the length of the work to be turned. Then transfer it to the lathe and bring up the tailstock center with just enough pressure to hold it firmly. The bar should be supported by blocks on the lathe bed to prevent it from turning on the centers by its overhung weight. The test is made by an indicator held in the toolpost and traversed by the carriage. If the reading of the indicator is not the same at all points on the bar, the tailstock should be set over until it is.

Arms of the adjustable bar are held between the lathe centers (looking down from above) and the center alignment is tested by an indicator held in the toolpost and traversed by the carriage



Isn't "Error Proof" Better Than "Fool Proof"

MARTIN H. BALL

The term "foolproof" has been used quite promiscuously for a long time, but to many of us it has sounded unnecessarily harsh and hardly like a just charge against a brother man. Would not "error proof" take the sting from the old-time phrase, and also give a better expression?

If one wanted to be a bit more thorough in his wording, he might say "error and blunder proof." I believe that everyone resents any implication that he is a fool, but even the most thorough and careful man would graciously almit that he has occasionally made errors and that sometimes he has blundered.

Shop Equipment NEWS

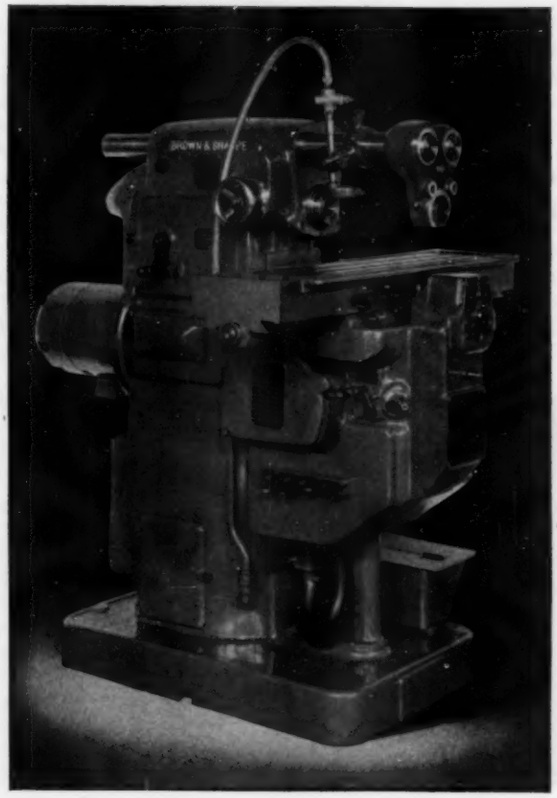
Brown & Sharpe No. 10 Plain Milling Machine

Full electrical control of all table and spindle power movements feature the No. 10 plain milling machine announced by Brown & Sharpe Mfg. Co., Providence, R. I. It is the latest addition to the line of production millers.

Combining many of the features of the "Light Type" and No. 12 plain machine, the No. 10 plain knee-type unit is designed specifically for the rapid manufacture of small parts on long or short runs. Sixteen spindle speeds, ranging from 55 to 1,800 r.p.m., together with the sturdy design and set-back spindle nose, makes possible the economical machining of a wide variety of small parts. Sixteen feed rates, ½ to 20½ in. per min., are available through simplified change gearing. The table motor provides a rapid-traverse movement of 300 in. per min. in either direction.

The machine has a 12 in. table feed, 2 in. transverse adjustment of the spindle, and 11½ in. vertical knee adjustment. Hand adjustments in all three directions, together with all other principal adjustments and operating controls, are within easy reach from the front of the machine.

A wide variety of automatic milling cycles is available. The control system employed assures a very rapid and sensitive tripping action, giving accuracy of control and dependability of performance. Automatic power movements are governed by adjustable table dogs through a control unit mounted on the front of the knee. Manual control is by pushbutton in the same unit. A "Stop" button for instantly stopping the table and a "Spindle Jog" button are provided.



A control switch permits the spindle to stop and start with the table, to rotate only during cutting feed, or to run continuously. Another switch sets the spindle to rotate in either direction, or to be inoperative. These control switches, together with a safety switch for instantly stopping both table and spindle are conveniently located on the knee. Automatic oiling is provided.

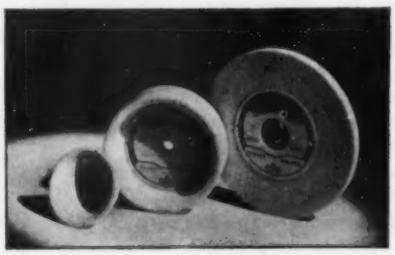
The spindle, table and coolant pump are each driven by separate, direct-connected, constant-speed motors. The table motor is stopped or reversed quickly by reversing the current. The spindle motor is stopped by the same method, and in addition has an integral, electrically controlled, mechanical brake which holds the spindle stationary.

The entire table driving mechanism, including the constant-speed motor, is built into the knee, with anti-friction bearings throughout. Spindle drive is from a direct-connected, flange-type motor mounted on the rear of the column. Spindle-speed changes are obtained in two series through simplified change gearing and a series selective lever.

Norton "B-E" Bond Tool Grinding Wheel

The "B-E" bond wheel for tool grinding, as announced by the Norton Co., Worcester, Mass., at the National Metal Exposition, is an improved form of the "B" bond wheel introduced several years ago.

The "B-E" wheel has a uniform, stable composition, and tests have

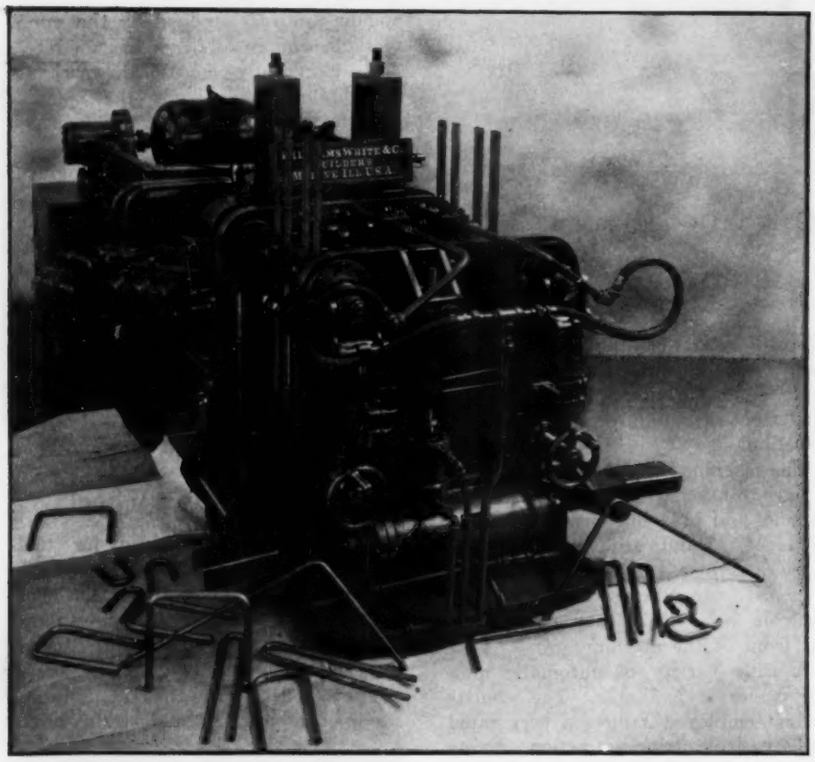


shown that it has a cool, free-cutting action. This is accomplished without sacrificing wheel life. Used with Alundum abrasive the wheel has a blue-gray color, and with 38 Alundum it has the same white color that has been a characteristic of the "B" bond. The wheel's features point to application on surface, centerless and other grinding operations.

National Drill Gage

The National Twist Drill & Tool Co., 6522 Brush St., Detroit, Mich., has introduced a stainless steel drill gage. This gage measures the conventional 118-deg. point, as well as the 135-deg. point that has come into common use. Information covering the proper clearance and chisel point angles for these point angles is given on the gage.

Williams, White High-Production Hydraulic Tube Bending Machines



Williams, White & Co., Moline, Ill., have recently designed and built a number of high-production tube benders for use in refrigeration manufacture. The machine illustrated is the Type G16 hydraulic tube bender. This machine has capacity to bend sixteen 1-in. diameter, 16-gage steel tubes to a 4-in. radius or less. It is possible for an operator and a helper to fill, bend and unload one set of sixteen tubes in approximately 30 sec., making an approximate production of 1920 bent pieces per hour.

Specially designed arbors are used inside the tubes while bending, to prevent flattening or wrinkling. Adjustable gages are provided for various length tubes and adjustable stops are provided for any desired angle of bend up to and including 180 deg.

Eight tubes are inserted in the dies at the front of the machine by the operator and eight at the rear by the helper. Hydraulic power is utilized for bending the tubes. After the bending operation the bending clutches are released by air, the bending units are returned and an air-operated ejector raises the bent tubes 4 to 6 in. from the dies. An air-impelled rack returns the dies after the tubes are removed. Interlocking throttle valves insure the operator and helper working together without injury to either.

Joints for Monel Thin-Wall Tubing

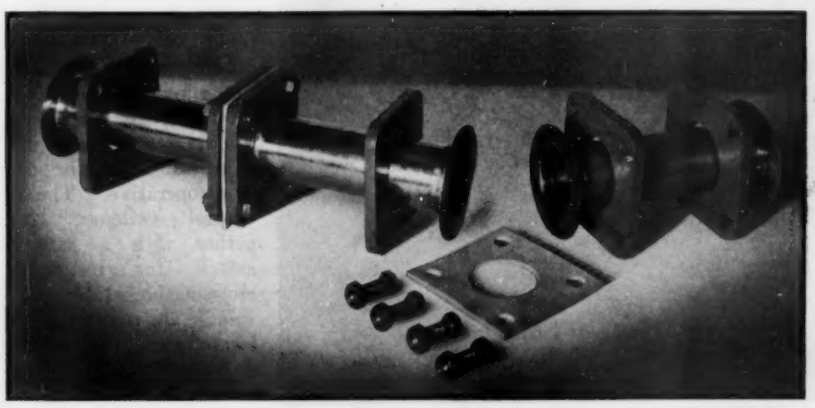
The development of a suitable joining method for thin-wall Monel tubing is announced by The International Nickel Co., Inc., 67 Wall St., New York, N. Y. Instead of flaring the Monel tube, a flange with a neck is pressed out of sheet stock, then a malleable-iron backing flange is slipped on the tube and the Monel flange is welded at the neck onto the tube. When a joint is bolted together, the iron backing on both sections serves to compress the welded Monel flanges, flattening them against intermediate gaskets and making them pressure tight.

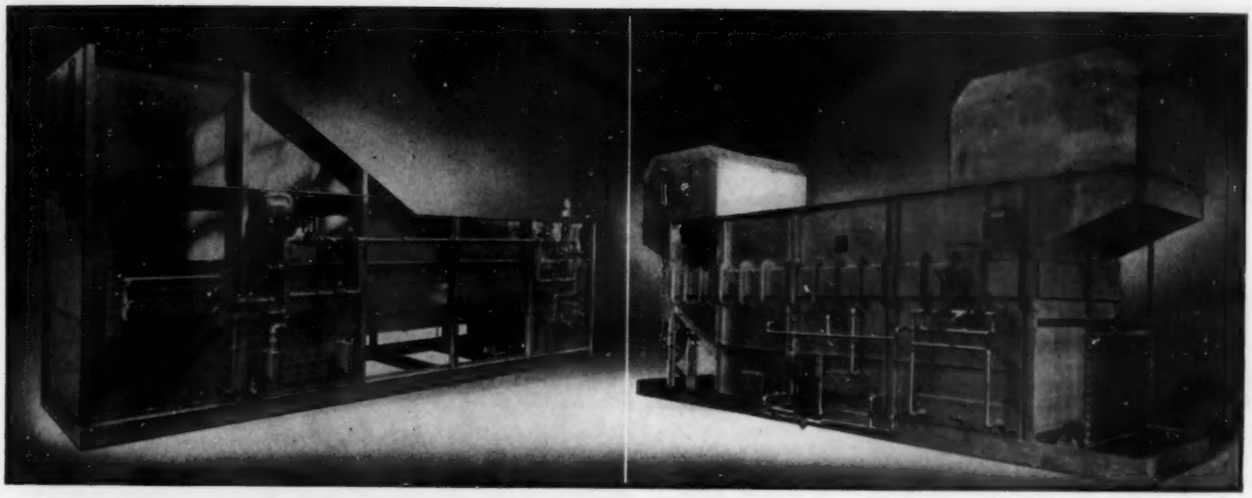
This flanged tubing is available in Monel in sizes from 1½ to 2½ in. outside diameter in standard lengths of 10 and 12 ft., complete with pressed flanges, gaskets, malleable iron backing flanges and bolts. Other lengths in Monel and lengths in nickel and Inconel are available on special order. Ells and T's can be furnished. Cost of long lines can be reduced as much as 50 per cent by this tubing connection.

Challenge Layout Surface Plate

The Challenge Machinery Co., Grand Haven, Mich., is now manufacturing a line of improved semi-steel surface plates designed particularly for accurate layout and inspection work. These

semi-steel plates are planer finished, smooth, square and heavily ribbed to prevent sagging. Standard sizes range from 12x18 in. to 48x96 in. Special sizes are made to order. Plates are available with or without supporting frame. The arc-welded frame is all-steel and has leveling screws.





Detroit-Rex Degreasing Equipment

The two conveyorized degreasers shown have recently been announced by the Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich. Both units are hooded to reduce natural solvent loss and are designed to use Dextrex non-inflammable and non-explosive solvents.

The unit shown at the left is a vapor-spray-vapor Detrex degreaser designed to handle small racked parts such as poppet valves and flat sheets. Hangers are spaced at intervals along the monorail conveyor to carry the work-holding racks. The machine is so arranged that work to be cleaned is carried by the conveyor through solvent vapors, then through pressure sprays of hot, clean solvent and then back through the vapors to leave the machine at the same end and elevation as it entered. This unit can clean approximately 6,500 small parts per hour at a conveyor speed of 10½ ft. per min. Over-all dimensions are: length, 20 ft.; width, 5 ft.; height, 9 ft.

At the right is illustrated a large three-dip degreaser designated as Model 3 DC-650, consisting of three chambers separated by two wide overflow dams. It is equipped with a two-strand, cross-rod type conveyor and a variable-speed drive. Designed for production cleaning of large stampings and deep-drawn parts, the unit has a cleaning cycle consisting of: first, immersion in boiling solvent; second, immersion in a solvent distillate rinse; and third, immersion in pure solvent vapors. The work is placed in baskets which are hung from the conveyor cross rods, and thus carried through the machine. The parts come out dry and clean, and ready for subsequent finishing operations. Steam coils are used for heating the solvent, and solvent vapors are condensed and re-used.

Detroit Tap-Chamfering Fixture

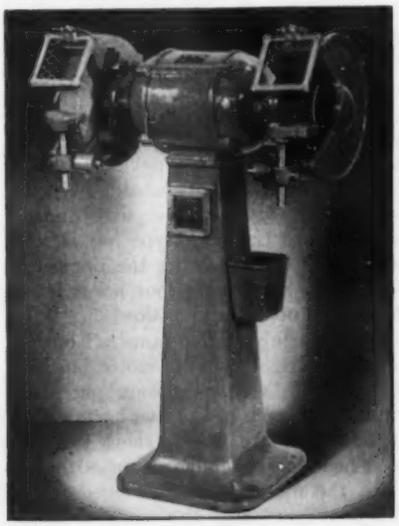
A tap-chamfering fixture for sharpening any size and type of tap up to and including 1¼-in. diameter, irrespective of number of flutes or shank length, is now available. This fixture is manufactured by the Detroit Tap & Tool Co., Detroit, Mich.

Taps are held and located in spring collets. This eliminates difficulties due to center holes having been ground away and insures concentricity. Necessity for separate cams for each flute type and number of flutes is eliminated by rotating the tap on an eccentric axis and indexing by means of a finger registering with the reground flute face. A balanced relief is assured. The amount of eccentricity or relief may be easily adjusted.

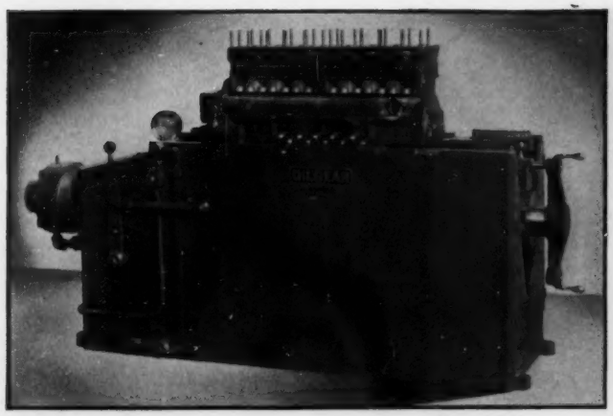
This fixture can be mounted on any type of grinding machine in either a right- or left-hand position. It is adjustable for height.

Clark 2-Hp. Floorstand Grinder

The Jas. Clark, Jr., Electric Co., 600-640 E. Bergman St., Louisville, Ky., is now building a floorstand grinder with a totally enclosed 2-hp. motor. The motor is mounted in heavy-duty precision ball bearings.



The unit is equipped with pushbutton control with overload protection, safety guards, non-shatterable glass eyeshields, tool rests, water pot and two 12 x 12-in. face by 1-in. hole wheels. Exhaust openings can be furnished in the wheel guards.



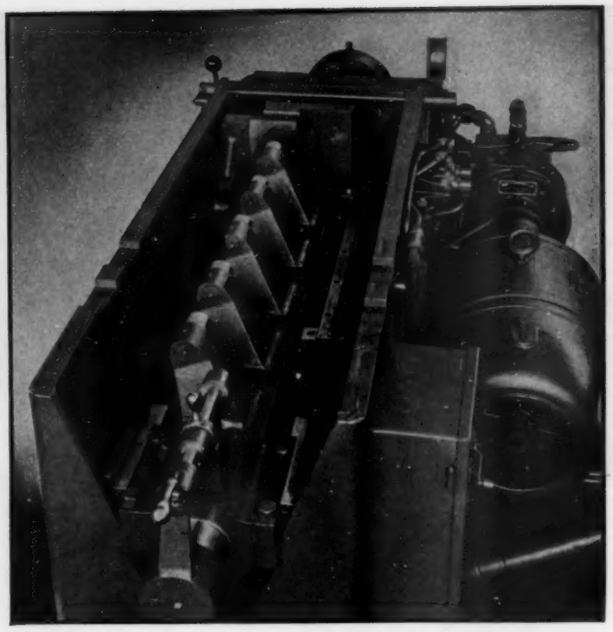


Fig. 1—Either six- or eight-cylinder blocks are taken in this Oilgear camshaft bushing press. Fig. 2—The horn-type pressing bar is in position for pressing five bushings into the camshaft bores in an eight-cylinder block

Oilgear 15-Ton Camshaft Bushing Press

The 15-ton camshaft bushing assembly press made by the Oilgear Company, 1408 West Bruce St., Milwaukee, Wis., will assemble four camshaft bushings in six-cylinder motor blocks or five camshaft bushings in eight-cylinder motor blocks on a high-production basis. Fig. 1 shows a side elevation of the press with an eight-cylinder motor block in position ready to be lowered over the horn type bar for the assembling operation. Both the horn-type pressing bar and the fixture for raising and lowering the cylinder block are hydraulically operated. When bushings are assembled in six-cylinder motor blocks the horn type bar is revolved 180 deg. to bring the opposite side of the bar having four horns into the proper operating position.

When assembling five camshaft bushings in the eight-cylinder motor blocks, the operator threads the proper size bushings on each of the five horn noses as shown in Fig. 2. A short pin on each nose locates the bushing oil hole. Then the motor block is moved from the conveyor onto the press fixture. When a hand lever is moved, the piston pulls the horn type bar, pressing all of the bushings home. Shifting the hand lever in the other direction returns the bar and depressing the pedal raises the fixture and block to conveyor height where the block is unloaded. A common conveyor line can be used for both the six- and eight-cylinder motor blocks, the machine being easily changed to suit the blocks in production. The adjustable stroke of this machine is 1½ in., return time is 1 sec., the lowering time 3 sec., and the raising time 3 sec. Length of the machine is 96 in., width 52 in.

"Ni-Carb" Case

By heat-treating steel in a gas atmosphere consisting essentially of carbon-rich gas and ammonia, A. W. Machlet, president of the American Gas Furnace Co., Elizabeth, N. J., has originated a procedure for quickly obtaining a thin, hard case. This process is termed "Ni-Carbing".

The procedure is a combination of nitriding and carburizing. The exact gas mixture, temperatures employed, time cycle and choice of equipment can be varied according to surface and production requirements. Composition of the steel to be treated, also the size and shape of the parts influence the procedure specifications.

In comparison with other case-hardening methods, the temperatures employed are low. The actual treatment may be followed either by cooling in the Ni-Carb atmosphere, or by a quench, depending upon the core properties required.

The process can be used in either rotary retort furnaces of the continuous or the batch type, or in full-muffle reciprocating machines. Belt conveyor machines with full muffle can be used.

Uniform results are obtained and are easily duplicated. Distortion is much reduced, especially where parts are cooled in the treating gas atmosphere. The case is "tough hard" and adheres tightly to the core. Sections can be turned over and riveted without damage. There is little tendency for scaling or flaking. The treated surface is highly resistant to corrosion and oxidation. Test samples subjected to average conditions have stood up.

When cooled in the Ni-Carb atmosphere, a part can be given a high polish; the appearance being that of polished nickel. When polished, it can be given all the various temper colors, such as straw, brown or blue, by means of temper heats, and still retain its original degree of hardness.

A case 0.010 in. thick requires from 27 min. for a plain disk to 1½ hrs. for a large part.

Tungsten Electrodeposit Process

The Tungsten Electrodeposit Corporation, Barr Bldg., Washington, D. C., is negotiating license agreements for application of its process for depositing tungsten electrolytically. It is said that the electrodeposit may be binary or polynary; that is, tungsten-nickel, tungsten-iron, etc., tungsten-nickel-cobalt, and other combinations and also quaternary combinations, such as tungsten-nickel-cobalt-iron. The deposit can be employed for protection against corrosion, erosion and

abrasion in dies, tools, and machinery of all kinds. Standard nickel plating equipment is said to be adaptable to the process and that it is not technically difficult to apply.

Tungsten electrodeposits are said to be dense. Standard thicknesses are obtainable, although relatively thin deposits are frequently justified. A homogeneous structure is obtained and moreover the electrodeposit can be carbided. The deposit is susceptible to high mirror polish and lustrous white colors are obtainable with several combinations.

"Shadowgraph" Industrial Scale

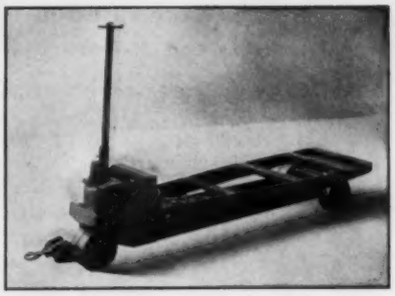
Eliminating about 30 per cent of the parts usually used in over- and underweight scales, Exact Weight Scale Co., Columbus, Ohio, has produced the

"Shadowgraph" for weighing manufactured parts. All indicating mechanism is eliminated, and a simple shadow is substituted obviating the possibility of parallax readings. The new scale registers twice as much travel per ounce than former models. A further advantage claimed by the manufacturers is that the scale need not be level when weighing is done.

It is designed in modern style and is equipped with rubber mountings. Balance ball, beam, poise and other working parts of the device are totally inclosed. Light is furnished by standard automobile lamps, and the scale is oil dashpot controlled.

Yale & Towne Super Heavy Duty Truck

Designed for loads ranging from 10,000 to 20,000 lb. to be moved within a plant by hand, the Yale XB multi-stroke truck has been announced by Yale & Towne Mfg. Co., Philadelphia. It has a multi-stroke lifting head with chain lift, which permits a fair-sized



man to lift the load without straining.

Six 6 in. face steel wheels, with 3 in. face twin front wheels make it possible to move heavy loads of machinery, dies or material without breaking up floors. Large sealed ball bearings, well lubricated, facilitate moving. The truck can be coupled to a tractor. Hydraulic release checks in the center of the frame drop the load without a jar and prevent damage. The massive lifting head and reinforced bar frame assure the truck standing up indefinitely under the most severe service.

Producto No. 2 Hand Miller

A heavy-duty, precision-type hand milling machine, known as the No. 2, has been developed by The Producto Machine Co., Bridgeport, Conn. This company has built conventional-type, light hand millers for some years, but requirements for a heavier machine with wider changes of spindle speeds to perform precision work have made this machine necessary.

A one-piece column supports the slides for the knee and cutter head and acts as a convenient method for

mounting the motor on top of the machine. It fully incloses the transmission which gives quick changes of spindle speeds. Drive from the motor to the cutter spindle is obtained through V-belts and pulleys that give six changes of speeds. A quick-change arrangement for shifting the belt is provided. The ordinary range of spindle speeds is from 106 to 1,050 r.p.m.

All slides are fitted with adjustable taper gibs and all bearings are accurately fitted and scraped. A larger knee, saddle and table, and cutter head are used. The No. 40 National Standard Taper is provided on the cutter spindle.

Specifications: Area of base, 30 x 28 in.; height from floor to top of motor, 63 in.; working surface of table, 26 x 6 in.; feed of table 8 in. by hand lever, 20 in. by crank lever; cross feed, 7 in.; vertical feed, 15 in.; net weight of machine, 1,350 lb., and motor, 1 hp.

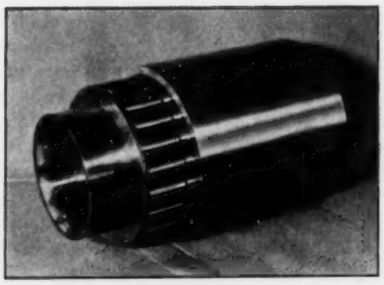
Durez Heat Resistant Molding Compound

Temperatures up to 450 F. will not affect moldings made of improved heat-resistant material recently developed by General Plastics, Inc., North Tonawanda, N. Y. The new material, available in black and brown and known as No. 34 and 37, is intended for such uses as electric iron handles, heater and appliance plugs, and other parts which must retain their electric strength without carbonization under relatively high heat. The material performs well, molds almost as fast as standard materials, and has excellent arc resisting properties as well as a smooth finish. It also has a very low water absorption rate.

Fafnir Industrial Roller Bearings

A complete series of heavy-duty industrial roller bearings, made in an extended range of almost a hundred sizes, is now being manufactured by Fafnir Bearing Co., New Britain, Conn. Their rated capacities range from 10,000 to 500,000 lb. to cope with severe service requirements of heavy metal-working machinery.

Rollers of $\frac{3}{4}$, $1\frac{1}{4}$ and $1\frac{3}{4}$ in. diameter have been used in addition to the $1\frac{7}{8}$ in. diameter previously available. Eighteen different bores are now offered. The large number of solid rolls in the cage assembly allows increased capacity. The cage is made



of specially form-rolled spacer bar stock, with carburized and hardened end rings. Rollers are held in place by spacer bars instead of rivets through the rolls themselves. Bars are riveted to the end ring, keeping the rolls permanently aligned.

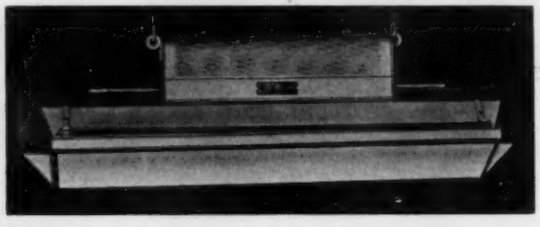
A fixed radial clearance allows for expansion when the inner ring is shrunk to the shaft. This clearance permits the bearing to operate without impairment should temperature differentials occur in operation. All parts are precision-ground and held to close tolerances.

G.E. Daylight Lamp Units

A cool, color-corrected light, adapted to difficult seeing tasks, is obtained by combining mercury vapor light and incandescent light in a single unit, introduced by General Electric Vapor Lamp Co., Hoboken, N. J. The blue-green effect of mercury vapor lamps is balanced by the reds and yellows of the incandescent light, producing a pleasing and eye-saving daylight effect. Because this balance is obtained by adding light, the daylight effect is obtained without the loss of efficiency which takes place when blue-glass bulbs or filters are used.

The mercury vapor light source is a straight 33-inch Copper-Hewitt tube, 1-in. in diameter, mounted horizontally beneath an aluminum reflector. The incandescent sources are four 150-watt Mazda lamps, located diagonally in a horizontal plane above the mercury tube. A total output of 11,200 lumens is evenly distributed through the 650 sq.in. of diffusing glass which forms an angular channel beneath the lamps. There is no glare even when work is being done on bright metal or other "shiny" surfaces.

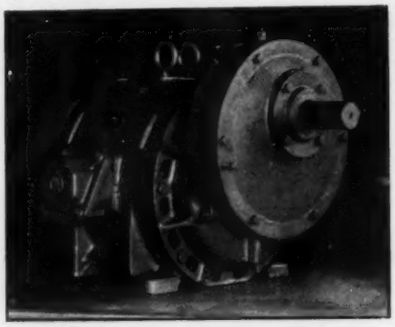
The lamp is either for 110- or 220-volt a.c. systems and weighs 67 lbs., complete.



Westinghouse Explosion-Proof Gear Motors

Single reduction, explosion-proof gearmotors, ranging from 1½ to 75 hp., have been announced by the Westinghouse Electric & Mfg. Co. for application in hazardous locations where speed reduction is required. Built to carry the maximum torque the motors will develop, the gears are of the single helical type, heat treated to provide maximum load-carrying capacity and utmost resistance to wear and shock. Anti-friction bearings assure high efficiency and maintain correct gear center distances.

They are inspected and approved by the National Board of Fire Underwriters for use in hazardous atmos-

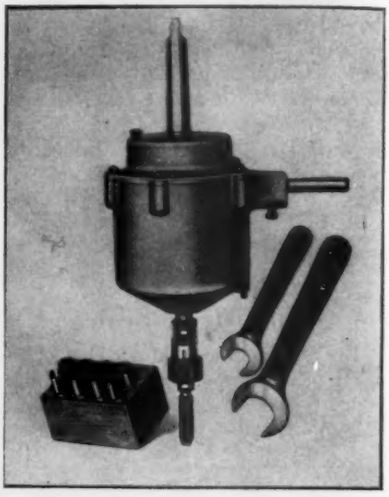


pheres containing gasoline vapors and other gases or vapors having equivalent or less hazard, such as petroleum products, ethyl alcohol, methyl alcohol, acetone, and lacquers, solvent vapors, such as in pyroxylin plastic, spray painting, varnish and other plants involving hazardous processes.

Procunier Tapping Attachment

Model E2 high-speed precision tapping attachment, fitted with "Tru-Grip" tap holder, has been announced by Procunier Safety Chuck Co., 12 South Clinton St., Chicago, augmenting the line of tappers announced recently.

Spring collets are ground on the outside diameter and the tap holder body is ground internally for greatest accuracy. Collets and tap holder are heat-treated. The tap holder is the smallest and lightest of its kind. The largest diameter is only 1 in. round and weighs, including tap collet and



chuck spindle, 6½ ounces. The chuck and spindle is one piece to assure accuracy, rigidity and long life. Smallness provides for clear vision while tapping close to any shoulder which may be present on the part. Lightness of the "Tru-Grip" tap holder reduces flywheel effect to the minimum and reduces strain on the working mechanism of the tapping attachment. Tap collets are furnished in a compact container for handling taps from a No. 7 to ½ in. standard.

Lyon Hydraulic Lift Truck

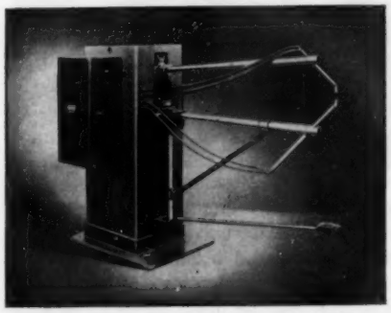
The 10-in. elevation lift truck announced by Lyon Iron Works, Greene, N. Y., obtains this elevation by raising a top frame through levers. The head containing the hydraulic mechanism is similar to the standard Lyon

hydraulic lift truck with 3 in. elevation. The general construction, with the exception of the auxiliary platform, follows along the line of the standard truck. The frame is electric welded. Rear wheels are equipped with Hyatt and the front wheels with Timken bearings. Ball thrust bearings are in the steering mechanism.

Eisler Spot Welder For Neon Signs

A special welding machine, announced by the Eisler Engineering Co., 750 So. 13th St., Newark, N. J., is designed to meet the particular needs of the neon-sign industry. This welder is adapted for the welding of frames, letters and other accessories for the erection of signs.

The welding horns are 48 in. long and the water-cooled electrode holders are angled to permit welding in corners or



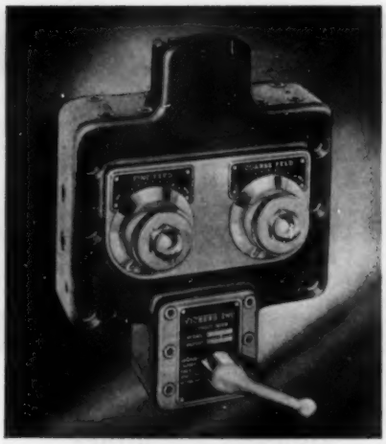
along edges. Adjustment between electrodes is obtained by raising or lowering the lower horn.

The unit is self-contained with all accessories assembled in the cabinet. It is available in foot-, air- or motor-operated models in sizes up to 250 kva. With motor drive, this welder is capable of 30 to 100 welds per minute.

Vickers Hydraulic Feed Control Panel

An hydraulic feed control unit, which is compact and flexible, and which provides smooth, accurate feeds for machine tools, has recently been announced by Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich. This Vickers Series C2–1237 feed control panel has only two moving parts and these are constantly lubricated.

This control unit is adaptable to a wide variety of machine-tool-cycle requirements. It provides for any cycle sequence made up of rapid advance, adjustable coarse feed, adjustable fine feed and rapid return motions. The



Vickers Hydraulic Feed-Control Panel blends well with appearance of machine on which it is mounted

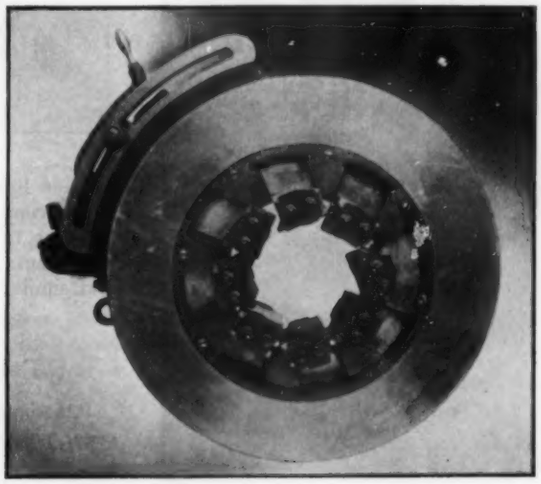
main control valve is actuated by one of three interconnected means: manually, mechanically by trip cams, and electrically by energizing solenoids separately mounted behind the unit. Adjustments of each of the feed rates are infinitely variable within a specified range, and adjustments can be made during the actual feeding operation.

Landis Stationary Pipe Dieheads

Two models of a 10-in. stationary pipe diehead have been added to its line by the Landis Machine Co., Inc., Waynesboro, Pa. Standard model is for standard pipe threads and the heavier model for oil-country tubular goods. The first has a capacity from 4 to 10 in., and the second from 4½ to 10¾ in. O.D. threads.

The dieheads are manually operated and are locked when closed. They have universal adjustment for size.

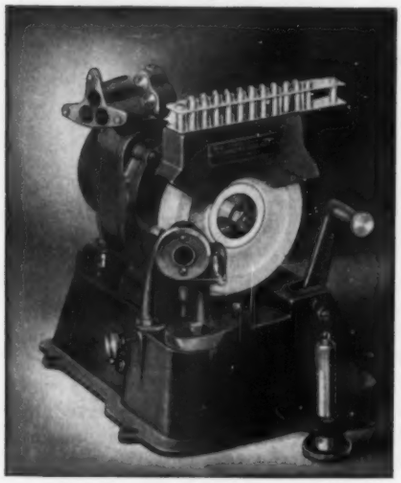
The heavier model is fitted with chaser holders that have an independent adjustment to and from the center. These dieheads are applicable either to Landis pipe threading and cutting machines or machines of other makes having sufficient clearance.



Standard diehead is fitted with chasers 2¾ in. wide; heavier model with chasers either 3 11/16 or 4⅜ in. wide

"Black Diamond" Drill Grinder

A drill grinder for grinding small wire-gage and fractional-sized drills accurately has been put on the market by the Black Diamond Saw & Machine Works, Inc., Natick, Mass. This ma-



chine grinds the lips exactly the same length, gives the drill the proper angle and clearance to insure easy cutting, and has a thin flange on the wheel for thinning the web of the drill.

The machine is easy to operate and requires no adjusting, regardless of the size of drill being ground. All working parts are hardened and ground to insure consistent accuracy. The wheel is dressed by means of a non-adjustable diamond set in a swinging fixture.

In operation, the drill is slipped into a bushing, then into a collet and this is then set to position in the locator. The holder is then placed in the grinding fixture where cams determine grinding of the drill.

Two sizes of this grinder are avail-

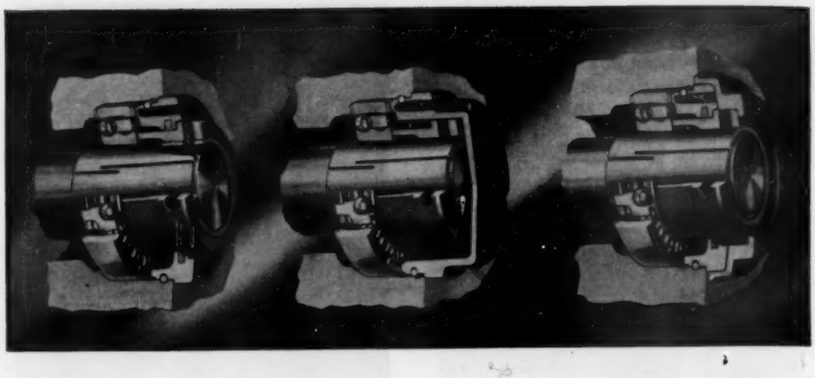
able: No. 1 size grinds two-lip twist drills from No. 60 wire gage to 11/32 in. diameter. A special locator for drills No. 60 to No. 70 wire-gage can be furnished for the No. 1 size machine. No. 2 size grinds ⅛ in. to ½ in. diameter inclusive, two-lipped straight-shank and No. 1 Morse-taper shank drills. Either of these two machines can be made for left-hand drills and either can be mounted on a bench or pedestal.

Greenerd Hydraulic Assembly Press

The treadle-operated No. 60 BB, 15-ton Greenerd hydraulic press recently announced by the Edwin E. Bartlett Co., Nashua, N. H., is specially designed for the assembly of ball bearings. When fitted with a suitable table it is adaptable for straightening operations.

The amount of pressure exerted by the ram is controlled by the pressure applied to the treadle. The pressure may be held evenly by the treadle or locked by means of a hand lever. Pressure may be released with the hand lever, when locked, or by releasing the treadle. When pressure is released the ram returns automatically to a power stop.

Any pressure from ½ to 15 tons may be obtained on the down stroke. Ram speed on the down stroke is at the rate of 36-in. per min. and the stroke is adjustable from 0 to 16 in. on the up stroke. The press is a self-contained unit having a tank in the base and the 3-hp. motor and pump mounted on the frame.



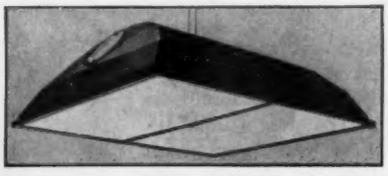
Ahlberg Ball-Bearing Housing Mountings

An economical means of securing an anti-friction bearing mounting in many kinds of equipment is announced by the Ahlberg Bearing Co., 321 East 29th St., Chicago, Ill. These CJB-Simplex machine units are designed to give the equipment manufacturer a simple and satisfactory means of using ball bearings in equipment where the bearing housing is either a part of the machine or must conform to the manufacturer's design.

Three capacities are available for a given shaft size. All are equipped with self-aligning ball bearings which enable these units automatically to compensate for normal inaccuracies in assembly and for shaft deflections. These units are available to fit shaft diameters ranging from $\frac{9}{16}$ to 3½ in.

Benjamin Light Diffuser

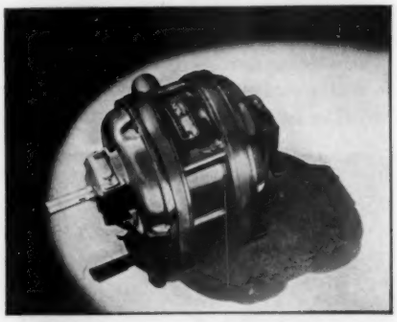
A combination mercury and incandescent lamp diffuser is announced by the Benjamin Electric Mfg. Co., Des Plaines, Ill. The combination of light from the two sources results in a soft



diffused light, providing a high degree of eye comfort. This unit is especially adapted to the lighting of industrial operations, laboratories, drafting rooms and similar locations.

G-E Polyphase Motors

Redesigned riveted-frame, squirrel-cage, polyphase induction motors, in frame-sizes from 1 to 15 hp. at 1,800 r.p.m. have been placed on the market by the General Electric Co., Schenectady, N. Y. These motors, available is a variety of electrical and mechanical



modifications, incorporate improvements in stator-coil insulation, frame construction and other features.

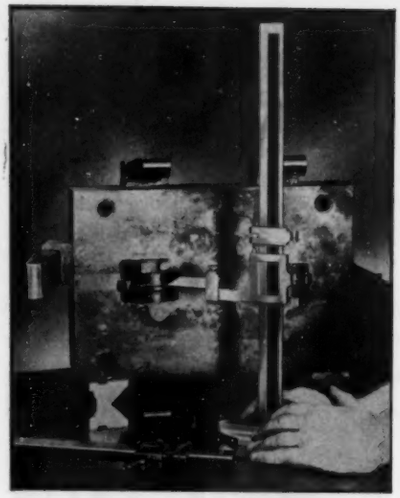
Different modifications of motors in this line can be used interchangeably for various applications requiring open, sleeve- or ball-bearing, inclosed, inclosed fan-cooled, splashproof or vertical motors. As a result of this adaptability many special requirements may be met with the standard available line.

An insulation system, utilizing recently developed materials and processes, is employed for the stator-coil windings. Malleable iron end frames with integrally cast feet, and cast-iron end shields are employed.

Starrett No. 454 Vernier Height Gage

The L. S. Starrett Co., Athol, Mass., has developed a No. 454 vernier height gage for measuring and inspecting jigs, fixtures and similar work. The gage is shown being used for the final inspection of a tool for the production of an automotive part.

The gage illustrated has a range of 18 in. and the bar is graduated on one side only, to be read by means of a vernier to 0.001 in. from 0 to 18 in. These gages are also available in 24- and 36-in. sizes.

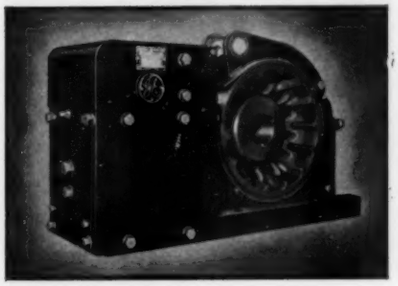


The hardened base is recessed in the bottom and is ground and lapped square with the bar. The base is 5¼ in. long, 2¼ in. wide and $\frac{13}{16}$ in. high The bar is approximately 1¼ in wide by ¼ in. thick and the grooves in the bar have a japanned finish.

G. E. Three-Shoe Magnet Brake

A three-shoe, spring-set d.c. magnet brake, combining mounting flexibility of the two-shoe brake and the braking surface protection of the band-type brake, has been announced by the General Electric Co., Schenectady, N. Y. Designated as Type CR9523 three-shoe brake, it is intended for use with steel-mill machinery, cranes, hoists, movable bridges, and conveyors where it is necessary to stop and hold a load at the motor armature. The frame is of bar and plate stock steel, welded for strength.

The peripheral length of the brake lining, over 85 per cent of the wheel periphery, is greater than that of either the conventional band or shoe type brake. Protection thus afforded against dust and dirt reduces wear on wheel and lining. Brake shoes are self-aligning, and braking in either direction is equal. A specially developed spring for brake setting gives low build-up, and the smooth braking action reduces mechanical stresses on the equipment. Desired braking characteristics are obtained by adjusting.



The actuating mechanism uses a clapper-type magnet the operation of which is not impaired by ordinary accumulations of dust and dirt. This construction assures positive operation under the severe conditions found in mill service. All adjustments are accessible from the top of the brake. When the top brake shoe is disconnected from the operating rod, the brake wheel may be lifted vertically from the brake without disturbing the brake setting.

Stanley Electric Soldering Irons

The Stanley Rule & Level Plant, New Britain, Conn., has announced a line of electric soldering irons designed to operate efficiently on either a.c. or d.c. power. These tools have compressed pure copper tips, machined for a valve-fit connection with the heating heads, to assure effective heat conduction and to protect connecting surfaces from oxidation and flux corrosion. The ventilated, removable, handle can be adjusted to a desired length and rigidly tightened. Each unit is equipped

with a 6-ft. flexible heating cord. There are eight different sizes, ranging from 52 watts with a 7/16 in. tip to 485 watts with a 1 3/16 in. tip.

Ward-Leonard Inclosed Switches

The Ward Leonard Electric Co., Mount Vernon, N. Y., has announced the extension of their line of industrial control equipment by the addition of several motor starters, disconnect switches and controllers. The Type A motor-disconnect switches have double-break heavy contacts with fiber arc snuffers. Switch No. 2701-208 is illustrated.

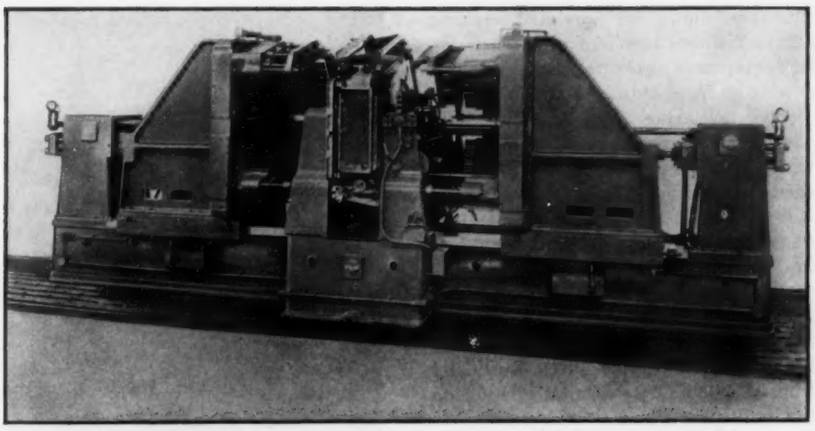
These switches are mounted in press-steel boxes having standard knockouts and hinged covers. The cover is locked closed while the switch is on and the switch cannot be operated while the cover is open. The operating lever can be locked in open or closed position.

These switches have ample capacity for frequent use and heavy overloads. They are available with two, three or four poles and from 30- to 200-amp. capacity for use with either alternating or direct current.

National Centrifugal Oil Extractors

The National Separator Co., Grafton St., Worcester, Mass., announces the modernization of its line of centrifugal oil extractors. In addition to changes in the appearance of this line, a top lid has been added and the units are fitted for direct-connected motor drive. A pan cover lifting device has been included in the design of the top lid.

Bearings are fitted with a force-feed oiling system. A safety lid lock is provided, rendering it impossible to raise the lid while the machine is rotating. The machines can be furnished with or without centerposts. The larger sizes are furnished with hydraulic hoists, and all machines have a drive secured through spiral gears running in an oil bath.



Baush Multiple-Spindle Drilling Machine

The 73,000 lb., five-station, drum-type drilling machine illustrated is one of the latest developments of the Baush Machine Tool Co., Springfield, Mass. This machine has a production capacity of 55 to 60 cylinder blocks per hour—finishing from the rough all valve and tappet holes as well as core drilling the thrust and four water holes.

The right-hand, fixed-center head contains 48 spindles and the left-hand, fixed-center head has 40 spindles. Including the spindle bearings, the machine contains 310 ball bearings and 230 roller bearings, resulting in a considerable reduction in power requirements.

The five-station trunnion is hydraulically indexed. The right-hand head carries a 30-hp. motor and the left-hand head a 25-hp. motor. Two 5-hp. motors drive the hydraulic pump and one 3-hp. motor operates the hydraulic index. All motors operate on anti-friction bearings. The machine is operated by pushbutton control and is electrically interlocked.

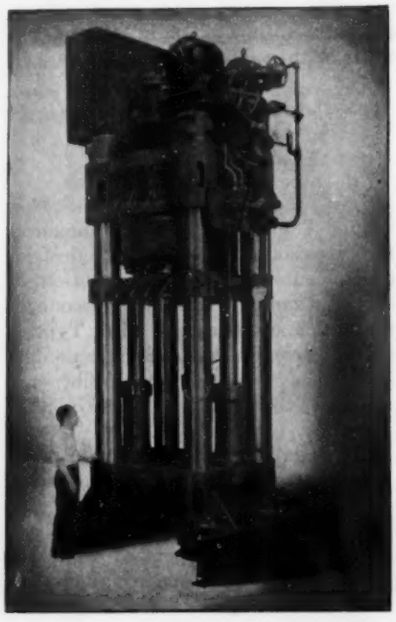
A similar machine has been designed and built for drilling, counter-sinking, reaming, counterboring and automatically tapping all holes in the oil pump and distributor pads on a six-cylinder block. It also spot faces the oil-pump pad for squaring with the hole.

Elmes Hydraulic Forming Press

The Charles F. Elmes Engineering Works, Morgan & Fulton St., Chicago, Ill., has recently built a 2,000-ton hydraulic press for heavy-duty metal forming. It is also suitable for compressing and dehydrating various products. The press is entirely self-contained; the oil reservoir, motor driven pumping unit and automatically controlled four-way valve being mounted on top.

The bed and cylinder are open-hearth steel castings of rigid design. The two push-up cylinders are bolted to the bed. All three cylinders are readily accessible for repacking. The prefill system speeds up the ram advance and return movements. Automatic push-button control is provided as is a timing device for the operating cycle.

The ram is 42 in. diameter and has a 24 in. stroke. The platen surface is 38x64 in. and the maximum opening between ram and platen is 72 in.



Landis No. 4 Geist Roller Pipe Cutter

The Landis Machine Co., Waynesboro, Pa., has recently announced that the No. 4 Geist roller pipe cutter has been improved by mounting the cutter disk shaft in Timken roller bearings instead of bronze sleeve bearings. This

change results in a stronger construction and reduces the frequency of adjustments to compensate for bearing wear.

The No. 4 Geist cutter, distributed exclusively by this concern, has a capacity for cutting off pipe within a range of ¼ to 4 in. diameter, inclusive.

"Sankey" Safety Foot Guard

Built to withstand a 300-ft lb. impact, the Elwood Safety Appliance Co., Ellwood City, Pa., has announced the "Sankey" foot guard which is easy to put on and take off, fits any shoe and cannot be kicked off. Three point contact gives perfect balance, snug fit and eliminates vibration. It is fitted with silent tread and adjustable cowhide strap with quick spring fastener and is made either of strong aluminum alloy or galvanized steel, corrugated to resist impact. The aluminum alloy guard weighs 12 oz.

The Round Table

BONUSES FOR TOOLMAKERS

"It won't work, I know it won't," growled Ed, as much to himself as to Al, as he dropped into his favorite chair in Al's tiny office.

"Why won't it? And what is it?" asked Al expectantly as he refilled his pipe.

"Bonuses for toolmakers," answered Ed. "Who ever heard of such a thing? They're talking about putting them in up in our toolroom."

"It might work. Depends on local conditions, I expect. I know two plants where they're using bonuses, and they've been doing it for some time. One of them uses a pretty complicated system, I admit."

"How does it work?"

"Well, perhaps I ought to say diemakers instead of toolmakers. Anyhow, they have a bonus divided three ways. The diemaker gets a regular hourly rate, around 80 cents. The office sets a time, and figures one-third of the bonus on beating that time. Another third depends on beating the estimated number of pieces between grinds. And the final third on the number of grinds before the die is worn out. You see, that catches the guy who tries to slam through a die just to beat the time estimate."

"Humph, and when does the guy get his bonus?"

"Well," admitted Al, "of course he doesn't get it until the die is used up."

"And how long will that take?"

"Three months, maybe."

"That's just swell," said Ed, with heavy sarcasm. "In the first place he doesn't know how much he's going to make, and in the second place he doesn't know when he's going to get it, and in the third place he may get laid off before he ever collects."

"All right, but why shouldn't a toolmaker have a chance to make extra money, just as much as a production man?"

"Because he's an artist."

Al chuckled.

"You can laugh, Al, but I know what I'm talking about. I used to be a pretty good toolmaker myself. A

real toolmaker takes pride in turning out a perfect job, and he doesn't want to be rushed about it."

"Maybe, maybe," acknowledged Al. "But then he shouldn't be sore if the pieceworker earns more money than he does."

"He isn't sore about that," insisted Ed. He wants a better rate, just as all the rest of us do, but he wouldn't go on piecerate production to get it. He isn't that kind of a worker. I think this whole idea is the bunk."

Which is right about the desirability of putting toolmakers on bonus? Is Ed right when he says that they don't begrudge higher pay for pieceworkers?

DISCUSSION

Jam Threads

I think Al's good judgment is lacking when he allows his pumps to be assembled by the jam-thread method. Sooner or later the user is going to have plenty of trouble should he have occasion to take his pump apart. The combination of a little rust and the more or less mis-shapen threads will induce some high-powered cussing and some hammer and chisel work in getting off the nuts.

It costs just as much to make tight-fitting bolts and nuts as it does to make standard fits. While Al may save the cost of drilling and cottering the bolts, he is likely to use up the saving in the extra labor cost in assembling. It is problematical if he is going to save either time or money in thus throwing away well-established practice. I think he will do better by using lock washers.

—Robert S. Alexander.

Another Story

I am inclined to favor Al's views in regard to a two-story building. Ed's contention that it is easier and cheaper to move material in a single-story plant is not always true.

If the product to be manufactured is of the heavy type, there are usually component parts that are comparatively light. Since the general working conditions are much better on upper floors, small parts may be made there to greater advantage.

If possibilities of expansion are given consideration when planning a new structure, the two-story building will possess advantages in that respect. If the upper floor is not needed at the time of completion, there are possibilities of renting the idle space without interfering with the activities on the lower floor. Then at the time of anticipated expansion, the space will be available without the need for more building and ground area.

—Peter L. Budwitz.

One of the first considerations in planning a new building is the cost of the land. If the factory is to be in the country where land is cheap, indications point to a one-story building. In the city where land is expensive, multi-storied buildings seem preferable. Another factor in deciding the type of building is the size and type of machinery necessary for production.

Whatever is done when the building is erected, five or ten years will show that many improvements could be made. Such improvements can be more easily made in a single-story building than in one that has several stories. Do not overlook the increased flexibility secured by the erection of a one-story building in such a way that additional stories may be added later.

—William A. Walter,
Purchasing Agent,
Pneumatic Scale Corporation, Ltd.

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Tools for Every Job

If duplicate tools are necessary to enable two jobs to be done at the same time, then there is no reason why sets of tools should not be segregated for the individual jobs. The cost of boxes or other containers will soon be repaid by the saving of operators' and storekeeper's time. At the same time, the tools can be in best shape for the particular metals they are to cut.

If the jobs are done at long intervals only, then Al's objection to the tying up of capital is a good one. In such cases the cheaper tools could be segregated, but large milling cutters, which are costly, could be drawn from the toolcrib as required.

—R. Hutcheson,
Kenton, Middlesex, England.

Variety

It is generally advisable to standardize on one make of machine because it facilitates setting standards of performance; it permits more intelligent planning; it reduces the number of repair parts necessary to be carried for maintenance; it permits moving operators from machine to machine without requiring coaching as to maximum speeds and feeds; and it makes the machine tool builder take more interest in his machines where he has a customer whose repeat-order costs are practically nil.

It has been found in many plants that in lining up production-flow charts, allowances had to be made for miscellaneous machines that could not perform up to the standard of the majority of machines of one make.

If possible, new makes of machines

should be tried out in a department handling small lots, experimental work or repair parts. However, no concern can progress by waiting until the other fellow has tried out a new make of machine and found it to be just what the doctor ordered for production.

—E. E. Gagnon.

To have different makes of the same kind of machine seems justifiable only if the machine bought later has a sufficient number of advantages over the one now in use, such as added production, greater capacity, less floor space, increased operating economy and ease of handling. Otherwise, as a general rule, it would be better to stick to the make of machine that has proved to be satisfactory.

My suggestion would be to consider the machine now in use, but by all means check specification against specification of competitive makes and, if there is any doubt, get the makers to furnish names of plants where their machines have made good, and check up with the plants referred to. If the advantages are sufficient to offset the disadvantages Al mentioned, then get a machine of different make.

When making comparisons, be sure to keep your own requirements in mind, and do not buy a machine of another make just because it may do something that the machine you have in use will not do, especially if you never expect to have use for that particular feature. —J. C. P. Bode.

Yes, Yes!

My experience has been that most executives are open minded about their assistants' ideas. Of course, there are some who do not like their juniors to have ideas of their own. But fortunately there are executives who give their juniors full scope to present new ideas. They listen to them before stating their own, sticking to them only if they consider them better than those of their assistants. They are the type of men who make good executives out of their assistants.

Too much agreement by foremen with executives about details of work is not to be desired. It is a foreman's duty to his superior to make such suggestions as he thinks will increase efficiency. In many instances foremen are responsible for the failure of executives to listen to suggestions. Either they have no tact in putting forth their ideas or their ideas are of no practical value. —W. E. Warner.

Orpington, Kent, England.

Going Places

I think Ed is right in suggesting that the pumps should be made on a mass-production basis, although the change from small-lot manufacturing to mass-production methods can not be profitably made in a short time. If the pioneers in the automobile, washing machine, vacuum cleaner and other large industries had not had the vision of big demands for their products, their machines would not be within the reach of most people.

An analysis of the market must, of course, be made before tools and other equipment are bought for mass production. But the world is big, and if the domestic market does not warrant the changing over to mass production, an investigation should be made as to the chances for exporting some of the product. If there is no export market for the pumps, then Al's conservative attitude is right and should be respected. —A. E. Fristedt,

Stockholm, Sweden.

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NEW BOOKS

WHY QUIT OUR OWN—*By George N. Peek with Samuel Crowther. 353 pages, 5½x8⅜ in. Paper bound. Published by D. Van Nostrand Company, 250 Fourth Ave., New York, N. Y. Price 50 cents.*

Published almost simultaneously with Mr. Peek's open support of the candidacy of Governor Landon, this volume, despite its claim of non-partisanship, is an out-and-out attack on the doings of the New Deal. It is written in the first person and is largely based on the author's service as AAA Administrator and as Special Advisor to the President on Foreign Trade.

The two primary points of attack are the farm policy and foreign trade. Mr. Peek calls the formulators of past and current administration programs impractical visionaries. He claims to base his scoring of their programs upon arithmetic rather than theory.

Most of the arguments are familiar, and some are convincing. Planned scarcity, the plow-up and the kill, form the center of attack against the farm policy. Here the author scores his best points.

In the treatment of foreign trade the hand of that chronic self-container, Mr. Crowther is most evident. The presentation brings memories of "America Self Contained" and again hinges on the high wages of American labor as compared to foreign labor. Coming at a time when the world has just begun to turn away from its bad years of intense nationalism, somehow the old theories fail to ring true. The analytical reader will be likely to detect a lack of consistency between proposals to export a farm surplus and those to exclude foreign-made products.

DRILLING AND SURFACING PRACTICE—*By Fred H. Colvin, Editor, American Machinist and Frank A. Stanley, Editor, Western Machinery and Steel World. 431 pages, 6x9 in. Clothboard binding. Indexed and illustrated. Published by the McGraw-Hill Book Company, 330 West 42nd Street, New York, N. Y. Price $4.00.*

Continuing their work in putting trends and developments in machine tool operation into book form, the authors now cover the fields of drilling, reaming, tapping, planing, shaping, slotting, milling and broaching. The treatment closely follows that used in their previous volume "Turning and Boring Practice."

While the authors devote considerable attention to the machine tools on which drilling and surfacing work is performed, their main concern is with machine set-ups and treatment of tools which have been found in practice to yield efficient results. Descriptions of tools and fixtures are aided by a profusion of sketches and tables which clearly portray the points made in the text. The sketches are supplemented by photographic views of work in process.

METALS HANDBOOK. 1936 EDITION—*1392 pages, 6x9 in. Indexed and illustrated. Imitation leather binding. Published by American Society for Metals, 7016 Euclid Avenue, Cleveland, Ohio. Price to non-members $10.00, to members $5.00.*

In this edition, the Metals Handbook has emerged from a useful collection of data on metallurgical practices

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to a comprehensive volume on subjects pertaining to the manufacture, processing and application of metals. The book represents the combined efforts of hundreds of members of the American Society for Metals who have contributed the articles, papers and reviews which make up its contents. Compilation of this material is the work of the Metals Handbook Committee, of which Dr. Charles H. Herty, Jr., is chairman.

The non-ferrous metals section is credited to a group of members of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, headed by Jerome Strauss.

The same general arrangement of subjects has been followed as for the last edition of the Handbook. Articles are listed under the major headings: General Data, Constitution of Matter, Structure, Properties, Testing, Melting, Casting, Mechanical Working, Heat-Treatment, Machining, Grinding, Welding, Soldering, Cleaning, Equipment and Application. Sources given for additional information include 2,500 references.

ADVERTISING AND SELLING INDUSTRIAL GOODS—*By Virgil D. Reed, associate professor of marketing and foreign trade, Boston University; chief, retail and wholesale trade, Bureau of the Census, U. S. Department of Commerce. 287 pages, 5¾x 8½ in. Indexed and illustrated. Cloth-board binding. Published by the Ronald Press Company, 15 East 26 St., New York, N. Y. Price $3.50.*

A practical guide rather than a theoretical treatise is the author's objective in this volume on the sale of industrial goods. His discussions and conclusions are based on plans which have actually been put into practice, drawing, where need be, on examples of failure or misdirected effort. Intended to be principally helpful to small and medium sized concerns, limited as to promotional appropriations, this book is also of interest to the student who has already concluded a study of elementary marketing. It does not deal with the layout and construction of an individual advertisement but considers rather the objectives of advertising.

Such considerations as the product's individuality, including company and group trademarks, buying motives and analysis of the industrial market are carefully weighed. In discussing media, trade and business publications, direct mail, directories and exhibitions come in for scrutiny. Catalogs are considered both as to contents and methods of insuring their use.

The entire presentation is made explicit by inclusion of representative industrial promotional campaigns.

THE PROFESSIONAL ENGINEER—*By Esther Lucile Brown, Department of Statistics, Russell Sage Foundation. 86 pages, 5¼x8 in. Illustrated. Half-cloth binding. Published by Russell Sage Foundation, 130 East 22d St., New York, N. Y. Price 75 cents.*

Those who follow the engineering profession usually find themselves in it because of circumstance, personal preference or simply the workings of destiny. Seldom do prospective engineers make an analytical survey of their profession, and even though they wished to do so they would have met difficulty in uncovering the data required.

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aims, "for the improvement of social and living conditions in the United States of America," this volume is an evaluation of an essential but much maligned profession. The author considers, first, education—the schools and their curricula, the students and faculties, and graduate training for engineers.

The number of engineers and demand for their services forms a vital chapter and this leads naturally to the subject of earnings. A summary of engineering trends ends the volume.

TRADE PUBLICATIONS

ABRASIVES. The Clover Mfg. Co., Norwalk, Conn., has recently published a booklet in which the various coated abrasives and their uses are discussed. The contents of the booklet are applicable to all such abrasives and should be of much interest to all who use or purchase abrasive materials coated on paper or cloth.

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ALUMINUM FINISHING. A booklet, "Finishes For Aluminum," has been issued by the Aluminum Company of America, Gulf Building, Pittsburgh, Pa. Mechanical, chemical dip, electrolytic oxide, electroplating and paint, lacquer and enamel finishes are discussed.

BAKING AND DRYING OVENS. Two bulletins describing applications of their finish baking and drying ovens are announced by the Despatch Oven Co., 622 Ninth St. S. E., Minneapolis, Minn.

CHAIN DRIVES. Morse silent chain drives, couplings, roller chains and sprockets are described and listed in a bulletin recently published. Copies may be obtained from the Morse Chain Co., Ithaca, N. Y.

CLEANING. A twelve-page booklet, entitled "Scientific Metal Cleaning" has been published by the Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich. This booklet describes the application of degreasing products to the cleaning of metal parts prior to finishing operations.

CLUTCHES. The Conway large size disk clutches are listed in bulletin No. L28 issued by The Conway Clutch Co., 1537 Queen City Ave., Cincinnati, Ohio.

COLMONOY. The wear- and corrosion-resistant non-oxidizing alloy "Colmonoy No. 6" made by the Colmonoy Co., Los Nietos, Calif., is described in a bulletin recently released.

COPPER ALLOYS. The Chase Brass & Copper Co., Waterbury, Conn., has published a new booklet designed to fill the need for a comprehensive and authoritative source of information on commercially important wrought copper alloys. Tabulated data is given of the important physical, mechanical and fabrication properties of these alloys.

DRILLING MACHINES. A booklet containing many illustrations of actual applications of their machines to drilling, reaming, tapping, boring, facing, and honing operations is available upon application to The Barnes Drill Co., 830 Chestnut St., Rockford, Ill.

FILES. Grobet Swiss files and saws for precision die filing and sawing machines, and the Grobet line of hand files are listed in new bulletins announced by the Grobet File Corp. of America, 3 Park Place, New York, N. Y.

FREE CUTTING STEEL. A recent folder issued by the Union Drawn Steel Co., Massillon, Ohio, discusses the advantages of Union Free Cut, Bessemer

(S.A.E.-1112), and illustrates many screw machine products cut from this material.

JIG BORERS. Societe Genevoise high speed jig boring machines No. 4B and No. 5B are described in catalogue No. 633 recently issued by the Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y. Copies may be secured upon request.

MICROMETER DIAL GAGES. A 32-p. catalog, No. 51, is available from B. C. Ames Co., Waltham, Mass., showing the company's wide range of dial gages. It is beautifully illustrated, and traces the improvements in design since the company made its first micrometer dial gage in 1900.

MILLING MACHINES. Circular No. M-716, describing the Cincinnati MH plain and universal milling machines, is available for the asking. Address your request to Cincinnati Milling Machine & Cincinnati Grinders, Inc., N.W. Cor. Marburg and South Sts., Cincinnati, Ohio.

MOLDING PRESSES. A 14-p. illustrated folder showing the line of automatic continuous rotary molding presses manufactured by Kux-Lohner Machine Co., 2145 Lexington St., Chicago, is available.

NICKEL ALLOY STEEL. The properties and applications of heat-treated wrought nickel alloy steels in sections up to about 6 in. in diameter or thickness is discussed in Bulletin P-1 issued by The International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NICKEL ALLOY STEEL. Automotive uses of nickel alloy steel are discussed and illustrated in Bulletin U-1 published by The International Nickel Co., Inc., 67 Wall St., New York, N. Y.

OIL SEALS. The National Motor Bearing Co., Inc., 1197—78th Ave., Oakland, Calif., has published a 28-page bulletin on oil and fluid seals. This bulletin has been planned to serve as a design reference manual and includes charts and tables.

OK TOOLS. A new index and discount sheet applying to catalog No. 11 has been issued by The OK Tool Co., Inc., Shelton, Conn.

PIPE TOOLS. A catalog listing 40 new and eighteen improved items in the "Beaver" line of pipe tools has been announced by Beaver Pipe Tools, Inc., 330-770 Dana Ave., Warren, Ohio.

REAMERS. Publication has been announced of a revised general catalog, No. 36, describing the Wetmore line of adjustable reamers and special tools. Several additions to the line are described for the first time. The catalog is available on request to the Wetmore Reamer Co., Milwaukee, Wis.

RECTIFIERS. A twelve-page booklet, No. B-2078, describing the selection and application of Rectox copper-oxide rectifiers for changing a.c. to d.c. without moving parts or chemical reaction, is announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ROLLING MILL BEARINGS. A 64-p. book, "The Answer to Rolling Mill Bearing Problems," has been issued by Timken Roller Bearing Co., Canton, Ohio. It is liberally illustrated, and contains a list of Timken equipped mills in the United States and Canada.

SCRAP. Simplified practice recommendation R58-36 covering the "Classi-

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fication of Iron and Steel Scrap" has been issued by the National Bureau of Standards of the U. S. Department of Commerce. This supersedes bulletin No. R58-28. Copies may be purchased from the Supt. of Documents, Government Printing Office, Washington, D. C., for five cents each.

SCREWS. Elco Tool & Screw Corp., Rockford, Ill., has issued Catalog 36, a 64-p. book covering the company's line of screws, bolts, washers and miscellaneous screw products. Four pages of tables and ready reference material are included.

SKID PLATFORMS. The Lyon Iron Works, Greene, N. Y., has issued Bulletin No. 109 describing the steel-frame skid platforms of standard and special application designs.

SOLDERING. "Expert Soldering" is the title of a folder recently issued by The Stanley Rule & Level Plant, New Britain, Conn. It discusses soldering methods and materials and describes the new line of electric soldering irons.

SPEED REDUCERS. Three bulletins have been issued by the D. O. James Mfg. Co., 1114 West Monroe St., Chicago, Ill. Bulletin No. 11 covers right-angle, spiral-bevel-gear speed reducers with ratios of 1:1 up to 6:1. Bulletin No. 16 covers right-angle, spiral-bevel, continuous-tooth herringbone reducers with ratios of 6:1 up to 45:1. Catalog No. 141 covers right-angle spiral-bevel spur gear speed reducers with ratios of 8:1 up to 1200:1.

TANKS, AUTOCLAVES AND SPECIAL PROCESS EQUIPMENT. Containers for the process industries, fabricated from steel and alloys and non-ferrous materials, are shown in a folder on "Special Equipment for the Process Industries," available from Edge Moor Iron Works, Edge Moor, Del., and 30 Rockefeller Plaza, New York.

TAP EXTRACTOR. Describing a simple, easy to operate device to remove broken taps from work when the break is flush with or below the surface, a circular has been issued by Walton Co., 96 Allyn St., Hartford. Conn.

TEMPERATURE CONTROLS. The Edison Electrical Controls Division of Thomas A. Edison, Inc., West Orange, N. J., has published Catalog No. 36, describing their line of temperature controls and thermal relays. Construction and application data are given and examples of recent applications are shown.

THREAD CUTTING. New instruction booklets have been issued by the Landis Machine Co., Waynesboro, Pa. One is the "Operator's Instruction Book Covering Landis Collapsible Taps," giving detail data on the LT and LM taps. The other is the "Operator's Instruction Book Covering Landis Pipe Threading and Cutting Machines and Stationary Die Heads."

TOOLROOM LATHES. The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, has issued a bulletin describing its line of 12-, 14- and 16-in. toolroom lathes. Features of these lathes are: new bed design to prevent deflections, centralized control, automatic oiling and sustained accuracy.

UNIVERSAL JOINTS. A circular describing the "Atlas" line of universal joints is announced by the Gray & Prior Machine Co., Hartford, Conn.

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